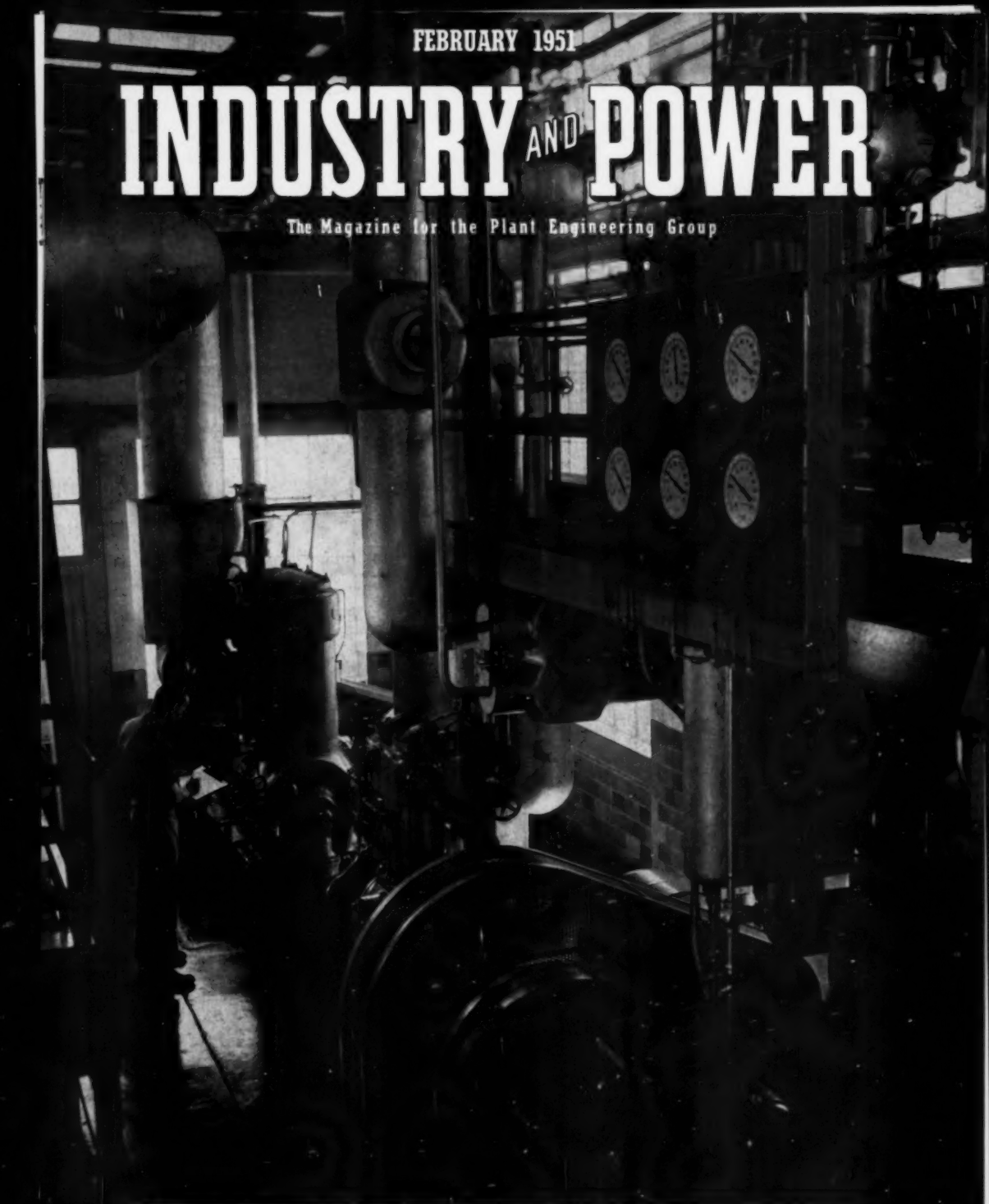
FEBRUARY 1951

INDUSTRY AND POWER

The Magazine for the Plant Engineering Group



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Only HARTZELL Fans Give You ALL These Advantages

MOTOR BASE SUPPORT RODS DOUBLE WELDED TO RING
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STURDY, RESILIENT MOTOR SUPPORT
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STANDARD-MAKE MOTORS, NEMA FRAMES

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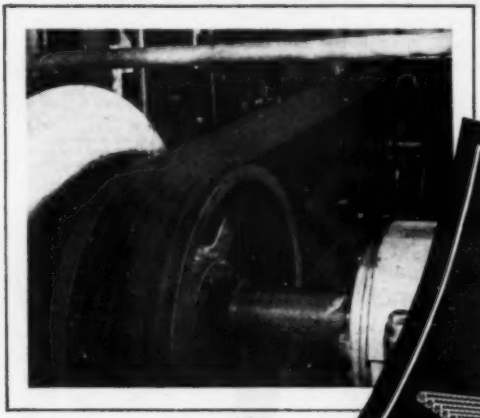

STANDARD belts—required 12 belts on 25" diameter pulleys.
GOODYEAR Steel Cable Belts recommended by the G. T. M.—Goodyear Technical Man—8 belts on 27" pulleys carry the load because they're "muscled" with steel.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GTM-Specified STEEL CABLE V-BELTS
to cut down size of DEFIBRATOR DRIVE
C
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A
Cover lapped on bottom only to increase flexibility
Single plane of airplane-type steel cables carries the load
Cushion section of live rubber

ASK YOUR NEAREST DISTRIBUTOR of Goodyear Industrial Rubber Products for full details on V-Belts "tailored" to your drive requirements — selected from the most complete line of V-Belt constructions. Or write Goodyear, Akron 16, Ohio.

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Edited specifically for the plant engineering group—the executives and engineers responsible for the generation, transmission, distribution and utilization of energy in its various forms for power, processing and engineered services

INDUSTRY AND POWER

The Magazine for the Plant Engineering Group

VOLUME 60 **FEBRUARY, 1951** NUMBER 2

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Refrigerating machines used to produce temperatures as low as minus 65 F in test cells at the Caterpillar Tractor Co. research laboratory

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TO A MINIMUM

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FOR pH AND PHOSPHATE

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Acorns of Science

Developments not yet available, but of interest to the Plant Engineering Group as previews of future tools and methods

Unconventional Adhesive

● Here is a material which hardens best when confined between impervious surfaces, such as metal, excluding air. This is contrary to the action of the ordinary adhesives which must be exposed to air or heat to produce rapid hardening and which set slowly between metal surfaces.

Anaerobic permafil, developed by General Electric research engineers, remains liquid while air bubbles through it, but hardens in a few minutes when away from air. The liquid penetrates cracks readily, seals leaks and pipe joints. Adhesive strength is excellent, readily joining metals and ceramics, as well as other materials. When announced, methods of aeration for transportation and storage should prove to be interesting in themselves.

Found: More Cobalt

● It's here in our own country but locked-up in low grade ores. With present total consumption, imported from Africa, earmarked for defense uses, availability of 4 million lb per yr, or a supply increase of over 50%, is good news on a material necessary for the best heat-resisting, wear-resisting and magnetic alloys.

The Chemical Construction Co. has developed a process to recover cobalt from Missouri and Idaho ore bodies. A refinery being constructed near Salt Lake City will have an annual capacity of 2 to 3 million lb. Canada will also contribute a sizable amount.

Better Dielectrics

● Old materials, processed by new methods, excel where they used to be scorned. The Naval Research Laboratory announces a method of cleaning asbestos by which, in the form of a slurry, it is sent through a centrifugal device that keeps the fibers suspended but allows the magnetite particles to separate. The bright white asbestos makes uniform paper with few conducting particles.

Paper made with mica from low grade ores and scrap is stronger and has greater capacitance than the kraft paper ordinarily used for condensers. Paper made of glass fibers, 1/20th the thickness of the human hair, is impervious to fungus and can be made thinner than present capacitor insulation. Both papers withstand more heat, archenemy of capacitors.

The glass paper can also be used as a filter 5000 times more effective than those commercially available.

Future Solvents?

● Sulfonyl fluorides can now be produced in experimental quantities and are available for evaluation purposes. Here are their properties: thermally stable; resistant to hydrolysis, chlorination and oxidation; and a wide range of solvent characteristics.

These and other properties suggest their application as solvents, heat transfer agents, intermediates in the manufacture of dyestuffs and as chlorination media. Commercial applications are still being investigated by the processors, the Pennsylvania Salt Mfg. Co.

For Stronger Metals

● Individual crystals of a metal are enormously stronger than the material of which they are a part. Cyril S. Smith of the University of Chicago is investigating the effects of surface energy on the shape of the grains and size of the corner angles, important in determining the strength by which the grains are bound together. Study of surface energy of the grains helps solve the control of impurities, such as sulphides and oxides in steel; while the knowledge is involved in making porous lubricated bearings. It also should be possible to develop solders and brazing alloys which will not cause intergranular penetration of stressed metals, thereby avoiding many failures.

Collapsible Oil Tanks

● Now an oil equipment company has developed collapsible tanks, drums and small containers. Although there are further experiments to be made before they are generally introduced, plans call for sizes ranging from 5 to 55 gal drums to units of 280 to 10,000 gal for bulk storage purposes.

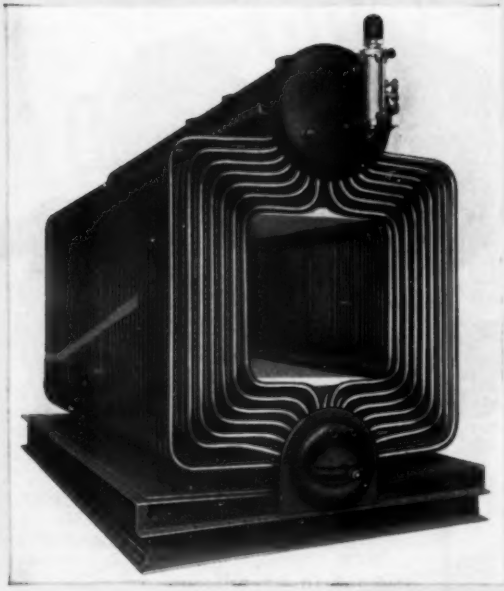
ERIE CITY

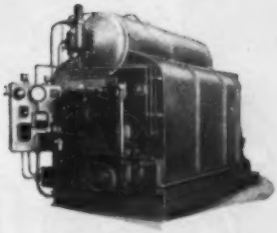
KEYSTONE

STEAM GENERATOR

Offers

2-DRUM WATER TUBE DESIGN IN A COMPACT STEAM GENERATOR

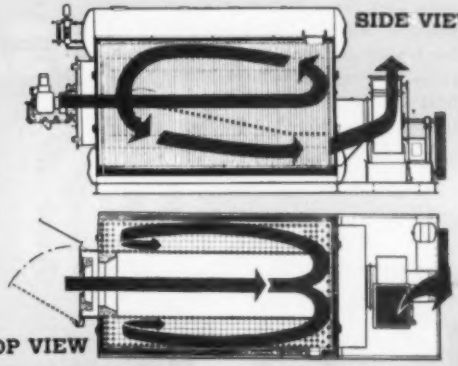




Here's big boiler performance in small cubage. Keystone combines in a factory assembled unit: low head 2-drum water tube boiler complete with boiler trim, a heavily insulated steel casing — automatic burner for gas, oil or both interchangeably — induced draft equipment and instrument panel with all controls mounted. Complete range of sizes from 75 to 800 hp. at pressures from 160 p.s.i. Write for Bulletin SB-38.

Note THE UNIQUE 3-PASS GAS TRAVEL

Hot gases contact solid side banks of water tubes in first pass to the rear of the Keystone, divide to left and right and are deflected upwards and over inclined baffles in both side water tube elements, again contacting bare metal heating surfaces—make return or third pass under these baffles, contacting bare metal again in the return trip to the rear and out of the boiler. Quiet induced draft fan provides all the draft required for top ratings. Spent gases need only be vented. No stack is required.



ERIE CITY IRON WORKS *1462 East Ave.* **ERIE, PA.**

JOHN ZINK

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SERIES "Y" and "YC"

COMBINATION GAS & OIL BURNERS

John Zink Series Y and YC Combination Gas and Oil Burners are particularly designed for boilers and process furnaces where maximum heat release at low excess air and high heat density place a premium on reliable burner performance at low first cost.

MAXIMUM DUTY—MINIMUM DRAFT

RUGGED WEATHER-PROOF CONSTRUCTION

SIMPLE IN DESIGN

LIGHT-WEIGHT FUEL GUNS ARE EASY TO REMOVE

BURN ANY COMMERCIAL FUEL OIL

BURN ANY GAS AT REASONABLE PRESSURE

DRAFT MAY BE NATURAL, INDUCED OR FORCED

CHROMIUM ALLOY STEELS FOR HEAT & CORROSION RESISTANCE

CENTER FIRING WITH BOTH FUELS ASSURES EQUALLY SATISFACTORY OPERATION WITH EITHER FUEL

ANY AIR TEMPERATURE MAY BE USED

WRITE FOR LITERATURE

JOHN ZINK COMPANY

4401 South Peoria Tulsa, Oklahoma

SILENTLY, but ruthlessly *(even as you are reading this)* rust is gnawing away at machines, tanks, fences, pipes, fire escapes, metal sash, stacks —every rustable metal—inside and outdoors!

To protect your investment — to keep every possible pound of new steel for the defense program — to make all rustable metal surfaces last longer—*adopt rust control with RUST-OLEUM as an important part of your maintenance program.*

RUST-OLEUM stops rust! Its tough, pliable, rust-resisting film gives excellent protection that prevents rust losses under many difficult rust-producing conditions.

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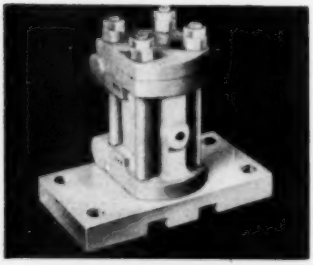
RUST-OLEUM CORPORATION
2472 Oakton Street, Evanston, Illinois

new equipment and developments

You can easily get more data on these new equipment and development items. Use the handy, postage-free order cards on Page 85. Just list the key numbers of the descriptive paragraphs in the spaces provided on the card and mail.

301—BIN VIBRATOR HAS FEW MAINTENANCE CARES

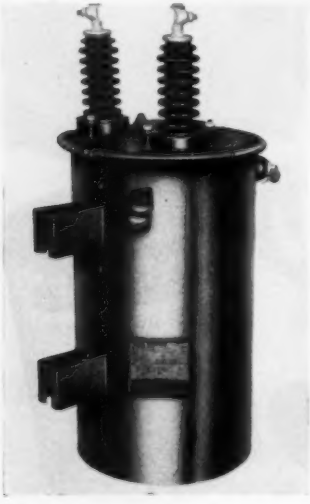
Designed specially for use on bins, hoppers, chutes and shakeouts this vibrator, manufactured by Cannon Vibrator Co., employs heavier pistons and longer strokes than



can be used on heavy-duty impact types without breakage. There is no impact of the piston on either end, no metal to metal pounding, no springs, no ear-splitting noise, and a greater, more intense and more positive vibration is produced.

302—COVER CLAMP SEALS TRANSFORMER

Wagner Electric Corp. has developed a sealed tank construction for its line of Form W distribution transformers. The Shur-Seal



cover clamp consists of a ring of "V" shaped cross section, which fits over the edge of the cover and the lip of the tank. This ring is tightened by means of a single bolt. The pressure it exerts is equal at all points, so that the cover gasket is uniformly compressed to form a positive seal. No "breathing" can take place, and there is no danger of oil leakage during shipment or handling. Drainage channels are provided to prevent water from accumulating on the transformer cover. An inhibited transformer oil reduces oxidation to the minimum.

303—UNIVERSAL SOCKET HAS BALL-TYPE COUPLING

Five PROTO universal power sockets and a universal joint, employing a ball-type coupling, have been announced by the Plomb Tool Co. They are designed for

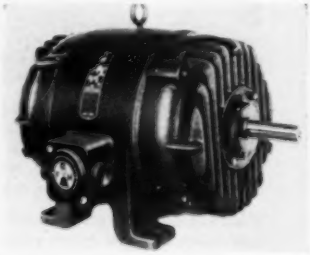
pneumatic or electric power-impact wrenches with ½ in. square drive, but are equally serviceable on adapter-equipped ⅝ and ¾ in. drive wrenches. The sockets have ½, 9/16, ⅝, 11/16 and ¾ in. hexagon (6-point) openings. These ball-type sockets are said to operate smoothly at all angles. They will not back off the work because force is evenly and constantly applied. All sockets use the same size of driver end, spring, pin and pin retainer ring reducing parts to stock where needed for continuous, high-speed production.

304—PACKING TOOL REDUCES INSTALLING COSTS

Packing and packing installation tool, unique for sealing tube sheet closures on heat transfer equipment for use with corrosive fluid, has been introduced by Greene, Tweed & Co., North Wales, Pa. This method of sealing considerably reduces high material and installation costs encountered on conventional seals where bolting or threading is involved. Costly downtime, commonly experienced for maintenance and replacement of conventional seals, is greatly eliminated. Molded packing is available in compositions that match the service. The Palmetto Tube-Seal has been proven to 400 psi on the tube side, yet provides elasticity and assures constant sealing efficiency despite any movement in the tube sheet that might be occasioned by expansion, contraction or vibration.

305—NON-VENTILATED MOTOR IS TOTALLY ENCLOSED

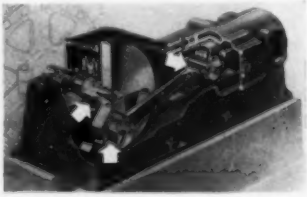
Fairbanks, Morse & Co. have recently extended their line of type QZE, totally enclosed, non-ventilated, squirrel cage, induction motors to include continuous duty



ratings built in NEMA standard frame 284. These motors conform in all respects to NEMA and ASA standards for totally enclosed machines, they are identical in mounting dimensions with standard totally enclosed, fan-cooled motors of the same ratings. They are suited for service in adverse locations where dirt, dust, lint, metal turnings and sand are prevalent, since there are no ventilating openings to clog.

306—BEARING CHANGE IMPROVES EFFICIENCY

The Chicago Pneumatic Tool Co. is now utilizing anti-friction roller bearings in the running gear on its horizontal duplex compressors. Spherical roller main bearings support the crankshaft and are also used at



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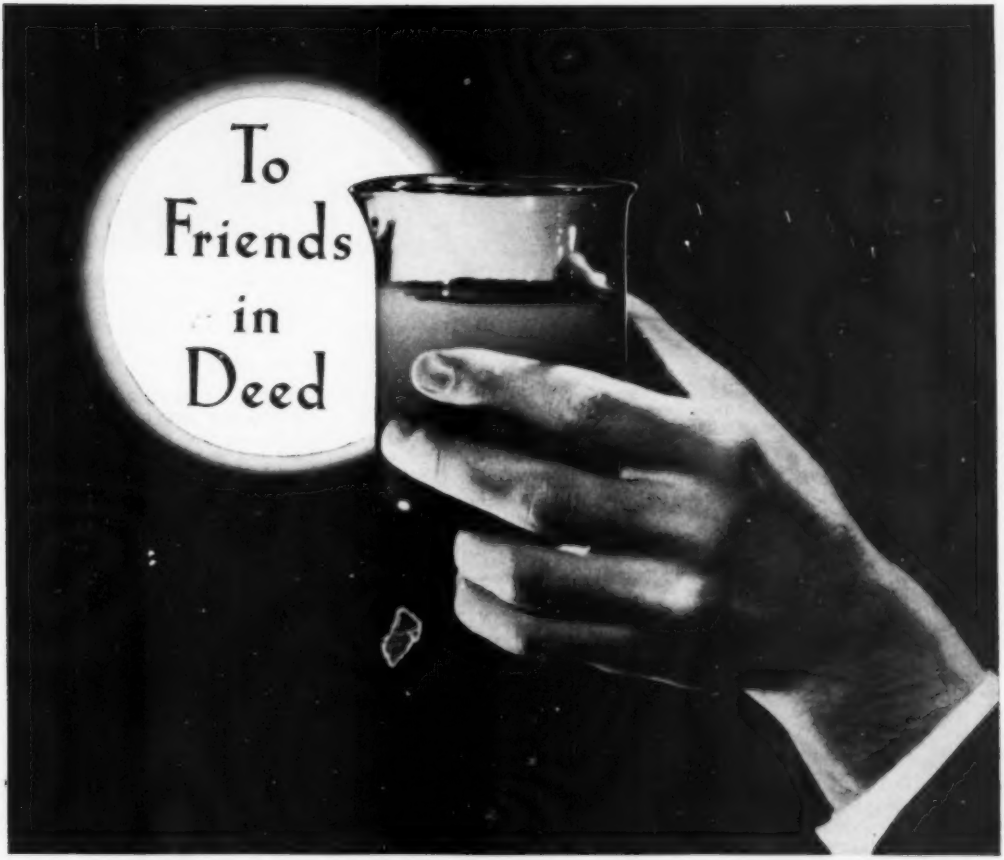


SEVERAL months ago a basic chemical shortage, created by strikes, caused Nalco a great deal of difficulty in supplying adequate quantities of water treatment chemicals to established users.

Uniformly, Nalco System users displayed a wonderful cooperative spirit and understanding patience during this trying period.

We wish to take this public means of thanking and expressing our pride in our friends in deed—and to note with satisfaction that not a single shutdown was reported as being necessary because of an inadequate supply of Nalco chemicals.

With the immediate prospect of greater military and defense uses of many chemicals, it is particularly reassuring to know that Nalco and Nalco System users have a fully demonstrated ability to work closely together in turning adversity into success.

NATIONAL ALUMINATE CORPORATION

6218 West 66th Place • Chicago 38, Illinois

In Canada: Alchem Limited, Burlington, Ontario

THE *Nalco* SYSTEM . . . Serving Industry through Practical Applied Science

(Continued from page 10)

the crank pin end of the connecting rod. Double row needle bearings are employed in the crankhead end of the connecting rod. The recent development of the oil injection system of bearing removal, when applied to compressor bearings and crank discs, makes possible this application. The roller bearings are self-adjusting, eliminating all chance of misadjustment in maintenance. The oil injection system of bearing and crank disc installation or removal permits use of one-piece crank discs and connecting rods. Bearing or crank disc removal and replacement can be accomplished with ordinary hand tools and a portable, hand-operated, hydraulic pump, and no heavy pullers or presses are needed on the job.

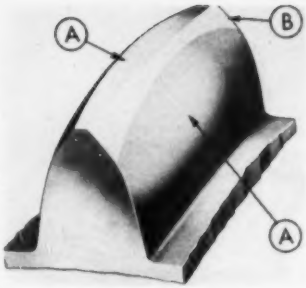
307—AIR CLEANER OBTAINS 99% EFFICIENCY

A complete line of separators for cleaning compressed air by means of centrifugal force is available from the Swartwout Co. Known as the Swartwout Airfuge, the separator comes in seven inlet and outlet tapping sizes, from ½ to 2½ in. According to

the manufacturer, the cleaner removes 99 percent or more of all impurities from compressed air without pressure drop. Moisture, oil, scale and other solids in the air are whirled outward to the walls of the unit where they drain down to the trap section. At the same time the clean, dry air passes unimpeded to feed line or tool, operating the equipment without danger of corrosion, wear, clogging, fire, explosion or freezing which occurs with contaminated air. A float-operated trap automatically releases accumulated liquids as they rise to a level above that necessary to effect a seal. Drain valve outlet is tapered to prevent stoppage by particles of scale.

308—BACKLASH IN COUPLINGS REDUCED

Special tooth design that increases load capacity and reduces backlash in flexible



couplings is now offered by American Flexible Coupling Co. External teeth of the coupling hub gears are crowned at contacting surfaces 'A', and are chamfered at 'B'. This reduces the clearances required and therefore reduces backlash and prevents high stress at the tooth-end. Full contact is made along the strong side areas of the tooth. The chamfer prevents the edge of the hub teeth from striking fillets at the root of the internal teeth or splines of the sleeve, so low clearance can be maintained while there is full contact along the side areas of the teeth.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

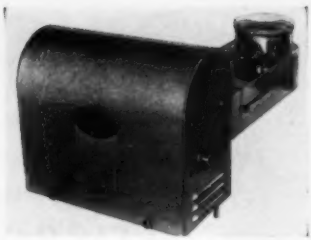
309—PLASTIC COVER HAS MANY USES

All-purpose plastic cover, designed primarily for auto mechanics in protecting car finishes and upholstry but also serving a variety of other purposes, has been developed by Industrial Covers Co. The cover

is made in two sizes—36 by 54 in. and 36 by 66 in. The product, made of Goodyear Vinylfilm, is water- and weatherproof, easy to clean, tough but lightweight and will not scratch. Paint spilled on the surface flakes off easily. The cover also has a special non-slip feature.

310—GAS BURNER HAS GOOD EFFICIENCY

Combustioneer Div. of the Steel Products Engineering Co. has announced a gas conversion burner that is approved by A. G. A. for natural, manufactured, mixed, LP and LP gas-air mixtures. Capacity ranges from 50,000 to 225,000 Btu. The unit features a triple-mix burner head. Primary air and gas are first mixed in the venturi tube in-



side the burner; and as this mixture spreads from the burner head it is sandwiched between two layers of secondary air. The flame is directed toward the sides of the furnace or boiler so hot gases scrub all the inside heating surfaces for even distribution.

311—OIL RESERVOIR HAS MANY APPLICATIONS

Trico Fuse Mfg. Co. now has available pyrex glass or lucite plastic reservoirs in 10 oz, 1 pt, 1 and 2½ qt. capacities. They are designed with lock ring or ratchet feed

adjustment to feed any predetermined number of drops per minute. The device is recommended for applications on large stationary bearings, machinery, journals, conveyer drive chains or wherever a large quantity of oil is required. Rate of feed is obtained by regulating a simple needle valve control, which is firmly locked in place. When shutoff lever at top of oiler is in upright position, oiler feeds at a set rate. When lever is flipped to the side, oil feed stops.

312—COLD-MILLED GREASE HAS OXIDATION STABILITY

An oxidation inhibited multi-purpose grease, that meets practically all requirements in the average industrial plant, is now being offered by E. F. Houghton & Co. One feature is resistance to high heat, cold or wet conditions. Cosmolube is a cold-milled grease of a very smooth texture, with excellent oxidation stability. It clings well to all metal surfaces, reducing leakage to the minimum. It will outlast ordinary lubricants, even under severe operating conditions. It simplifies lubrication, reduces errors of mis-application, saves time and space because one grease does many jobs.

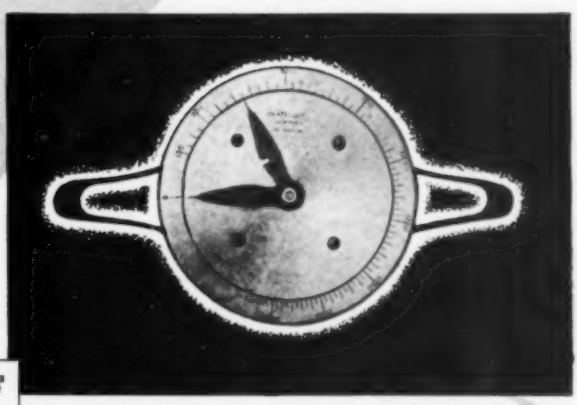
(Continued on page 14)

WHEN THE PRESSURE OF INDUSTRY IS GREAT...COUNT ON CHATILLON FOR UNFAILING AID!

Since 1835, John Chatillon & Sons have been world famous for the precision manufacture of force measuring devices which meet the most specific requirements of industry.

CHATILLON TRACTION DYNAMOMETERS

- For determining sag in stringing transmission lines.
- To ascertain force required to pull underground cables and wires through conduits.
- For guy wire tensions, pole, insulator and anchor strength.
- For use in conjunction with apparatus that apply force to test strength of materials and structures.
- Gear Mechanism is Enclosed in Dustproof housing.
- Accuracy is Guaranteed to within 2% plus or minus of dial reading.



Traction Dynamometers are made in Capacities shown below:

Capacity & Graduations in lbs.	First Dial Reading lbs.	Dial Dia. Inches	Shipping Weight lbs.
1000 x 10	100	7	8
2000 x 25	150	7	9
5000 x 50	250	8	9
10000 x 100	500	10	15
25000 x 200	600	14	45
50000 x 250	1000	16	56
100000 x 500	1000	18	95

Larger Capacities to Order

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Gentlemen: Please send me complete brochures on

☐ Traction Dynamometers ☐ Push Pull Gauges

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JOHN CHATILLON & SONS

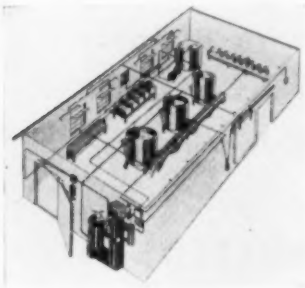
85 CLIFF STREET, DEPT. IP, NEW YORK 7, N. Y.

Manufacturers of Precision Instruments Since 1835

(Continued from page 12)

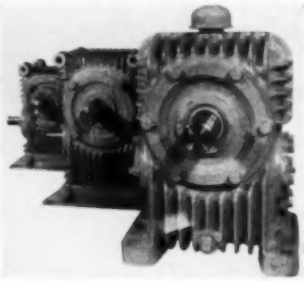
313—DRY CHEMICAL SYSTEM FOR FIRE HAZARDS

A dry chemical piped system, designed for automatic protection of industrial fire hazards, has been developed by Ansul Chemical Co. It is operated by a heat-actuated device. When a fire starts and air temperature increases, air within the device expands. This trips the nitrogen cylinder release, pressurizing the dry chemical container. Dry chemical is then discharged through distribution heads onto the fire area. Automatic controls can be added to close doors, windows, ventilation ducts and to operate valves on pipes carrying flammable liquids.Electric controls can be included to shut off motors and fans, sound alarms and transmit signals to central stations or fire alarm headquarters.



315—SPEED REDUCERS HAVE UNIFORMITY

Improved appearance and greater casting uniformity characterize the improved line of standard duty speed reducers announced by Cone-Drive Gears Div. of Michigan Tool

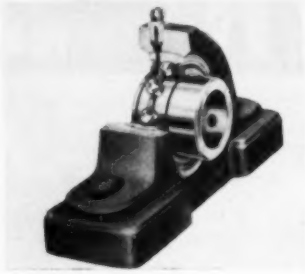


Co. Employing double-enveloping gearing, all operating parts are directly interchangeable with former models. Available in standard ratios of 5/1 to 50/1. Horsepower ratings range as high as 9.04 at 1750 rpm.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

316—BEARINGS HAVE SELF-ALIGNMENT FEATURE

Boston Gear Works is now presenting a stock line of self-aligning, precision ball bearing pillow blocks and flanged cartridges in shaft diameters from ½ to 1¼ in. One exclusive feature is a specially designed labyrinth seal which automatically pro-



vides the correct amount of lubricant and excess grease escapes under pressure. The chrome alloy ball bearing, used in these supports, has a spherically ground outside diameter to permit the bearing to align itself in the rigid, one-piece, precision machined housing. This makes for accurate shaft alignment and quick mounting. The bearing is supported around its entire circumference, assuring a solid mounting.

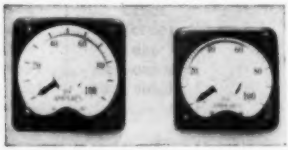
317—SELENIUM RECTIFIER CARTRIDGES RATED AT 25KV

High voltage selenium rectifier cartridges, with ratings up to 25,000-v per cartridge and current ratings to 75 ma, have been recently developed by the International

Rectifier Corp. These rectifier cartridges utilize five different selenium cell sizes varying from ⅛ to 1 in. in diameter with corresponding current ratings varying from 1.5 to 75 ma. They are designed to meet rigid humidity, altitude, vibration and shock specifications and can be operated over the temperature range of 55C to 100C.

318—CIRCULAR SCALES PROVIDE READABILITY

Full-view Type K-24 circular scale switchboard instruments are now available from the Westinghouse Electric Corp. The instru-

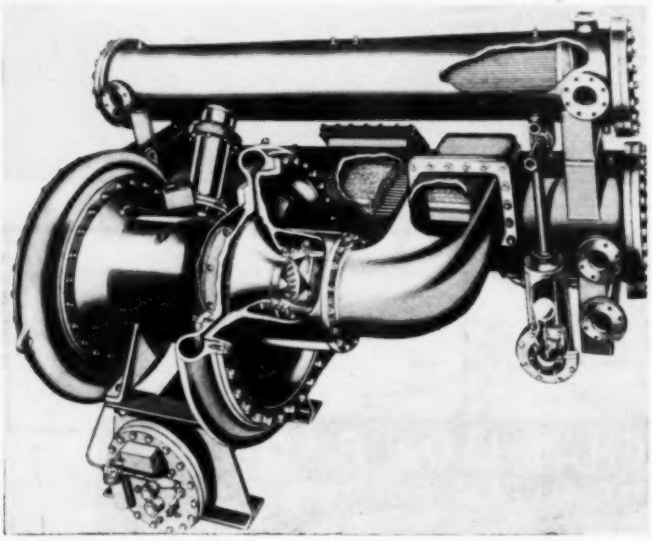


ment provides maximum readability from the steepest angles and causes no objectionable shadows on the scale, even under adverse lighting conditions. Design is the same as the original Type K-24 except for

(Continued on page 16)

314—CENTRIFUGAL COMPRESSORS ARE HERMETICALLY SEALED

Substantially lower operating, maintenance and installation costs for a wide range of comfort and industrial air conditioning systems will result from introduction of the CenTraVac—centrifugal water-chilling unit—according to The Trane Co. Five years engineering and laboratory testing went into development of this first hermetic centrifugal refrigeration unit. It was designed for the broad cooling markets served by compressors with capacities of 45 or more tons of refrigeration. The unit will use F-113, a member of the stable Freon refrigerant family. Five sizes will be available.



WORK HORSE FOR HORSEPOWER

QUAKER BELT STILL GOING STRONG AFTER 10 YEARS

Running smoothly day and night for six years without "shut down time"... and then put in an eight hour day for more than four years... at all times giving maximum power delivery... with Quaker on the drive. Previous belt lasted five years. Result: A saving of more than $400 in belt replacement cost alone!

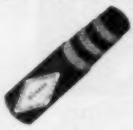
Performance like this comes naturally when Quaker Transmission Belts are on the drives. That's because they are scientifically designed and made of the highest quality duck and rubber compounds. The special construction results in greater load capacity, longer flex life, and prevents excess stress and slippage. And Quaker belts can take severe flexing like the short-center drive illustrated below.

The work horse ability of Quaker Transmission Belts characterizes all of Quaker's pre-tested, performance proven products.

If you attend the 34th Annual Convention of the National Sand and Gravel Association, stop by at our Cleveland branch and see the Quaker products on display. The address is 2901 Chester Avenue, Cleveland 14. Your visit will certainly be welcomed.

HOSE THAT LASTS

... because it has been pre-tested to stand pressure and resist wear. There's a Quaker Hose for use with air, water, steam, volatiles, acids, and gases.



V-BELTS THAT BOOST POWER

Quaker's complete line of V-Belts for every power installation is pre-tested and service-proved to provide sure-grip ... to slip less ... and to save power.

QUAKER RUBBER CORPORATION

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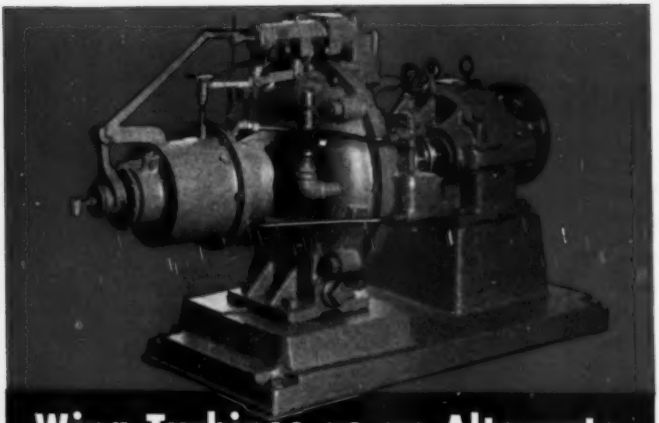
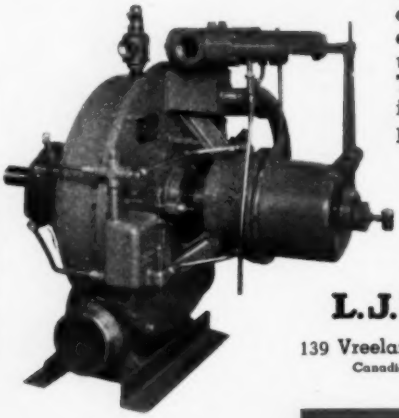
QUAKER RUBBER PRODUCTS *custom made for every industrial use*

QUAKER RUBBER CORPORATION · PHILADELPHIA, PA. · QUALITY SINCE 1850



Wing Turbines as an Alternate Source of Auxiliary Drive

The use of turbines as an alternate source of auxiliary drive is good business in these days of urgent production and uncertain industrial conditions. When electric motor drive is subject to power failures due to strikes, fires, floods, hurricanes (or bomb attack), the ability to continue with steam auxiliaries is an advantage that is worth many times the cost of the alternate equipment. And the use of Wing Steam Turbines for such services as pumps, compressors, fans, blowers, generators, etc., can cut power costs by acting as a reducing valve on boiler steam for use in process and heating.



L. J. Wing Mfg. Co.

139 Vreeland Mills Road, Linden, N. J.

Canadian Factory: Montreal, Canada

Write for a copy of Bulletin SW-50

Wing

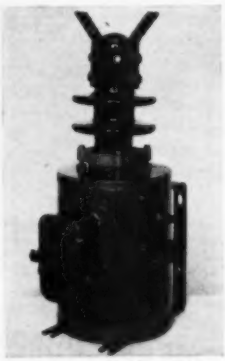
AUXILIARY TURBINES

(Continued from page 14)

cover and dial. The cover is approximately 3/8 in. wider and higher, but still within the limits of ASA C39.1. The drilling plan for the two types is identical, and they can be used interchangeably.

319—OUTDOOR TRANSFORMER HERMETICALLY SEALED

An outdoor current transformer (Type KO) designed for versatility in mounting has been announced by Allis-Chalmers Mfg. Co. that can be mounted horizontally, vertically or inverted. It is built for high accuracy in metering and heavy duty relay application. Both primary leads are brought out to blade type terminals through a single porcelain bushing having generous creep surface. The welded transformer case is pressure tested and hermetically sealed. Maximum insulation strength is achieved by compound filling under a "vacuum-pressure" process, which entirely eliminates air voids, resulting in a low power factor and a maintenance-free installation. Available in standard ratings up to and including 800 amp and voltage classes 5, 8.7 and 15 kv.



320—QUICK COUPLING FOR FLUID AND GAS LINES

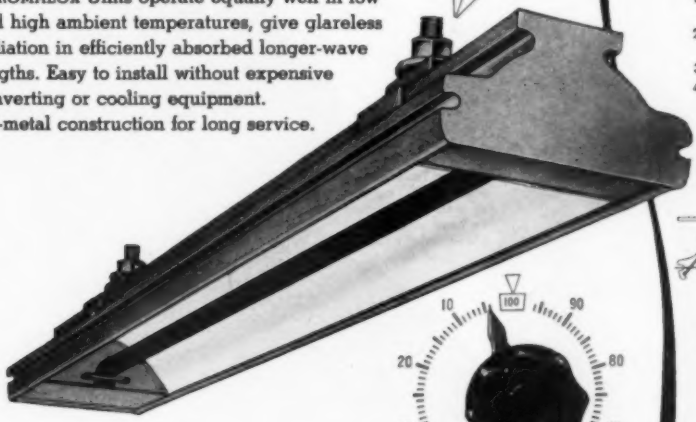
Two-piece self-positioning quick coupling, said to open and close with less than a quarter turn in less than a second, is announced by The Mead Cornell & Co. The body consists of three tapered locking lugs and mating male or female tail piece or hose spud. Available in aluminum, high test bronze, stainless steel and Ni-Risist. Sizes range from 1/2 to 6 in. inclusive for 150 psi standard and 2000 psi special service. Flat tail piece face presses against gasket without twisting.

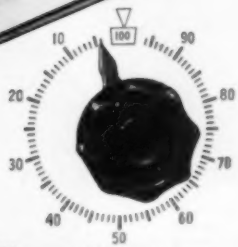
(Continued on page 98)

Uniform, EXACT infrared heat

at the turn of a dial

You can "dial" the exact uniform heat you need to fit the job in infrared drying, baking, preheating, curing, dehydrating and similar applications when you use CHROMALOX Electric Radiant Heaters. Compact CHROMALOX Units operate equally well in low and high ambient temperatures, give glareless radiation in efficiently absorbed longer-wave lengths. Easy to install without expensive converting or cooling equipment. All-metal construction for long service.





CHROMALOX Radiant Heaters

trouble-free — All-metal unit withstands shock, vibration, dust, blows and rough handling. Not affected by splashed liquids; nothing to shatter.

flexible heat — Precise temperatures at the turn of a dial, easily regulated for changed working requirements. Ovens can be zoned for stepped-down heat.

color-blind — Chromalox Radiant Heat ignores color variations; longer-wave length infrared is absorbed equally by all colors, textures, surfaces.

uniform heating — Light, dark or multicolored work may be processed simultaneously. Proper heater positioning assures an even blanket of heat without hot-spots.

CHROMALOX

Electric heat for modern industry

Only **Chromalox** Radiant Heaters offer these features

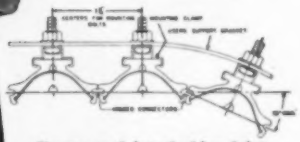
•

ALL-METAL DESIGN

1. Inconel-sheathed Chromalox triangular heating element.
2. Highly polished, non-oxidizing reflector.
3. Rigid, extruded metal housing.
4. Interlocking connector for assembling banks of heaters.

•

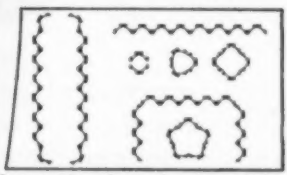
QUICK, EASY INSTALLATION



Clamps and interlocking joints simplify assembly of units into ovens, banks, tunnels, etc.

•

VERSATILE APPLICATION



Cross-section views of a few of the many oven designs possible with Chromalox Radiant Heaters.

For more Know-How—
Send for complete Application File

It shows you how many others are saving time, and increasing production with Chromalox Radiant Heaters.

IC-48

EDWIN L. WIEGAND CO.
7520 Thomas Boulevard
Pittsburgh 8, Pa.

Yes . . . send me the application file on Chromalox Radiant Heaters

Name_____

Company_____

Street_____

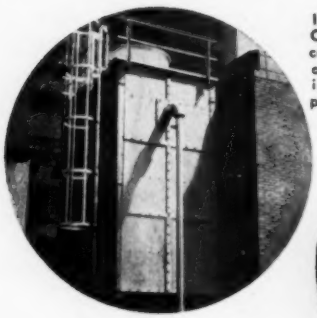
City_____ Zone_____

State_____

the same engineering excellence

in every Foster Wheeler

FROM THE SMALLEST...



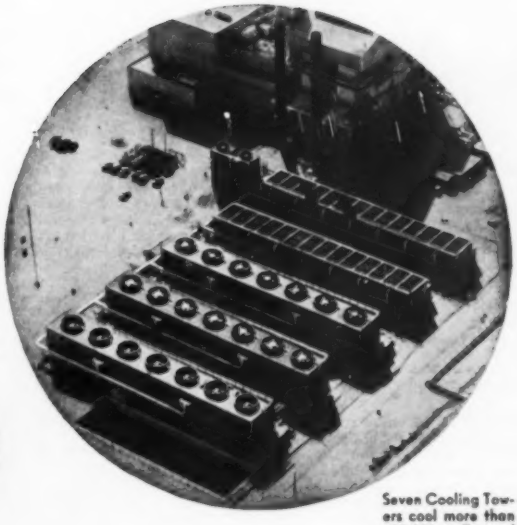
"Package" type Cooling Tower on department store roof, cools 300 gallons of water per minute.

Induced-draft 1-cell Cooling Tower, which cools 5,000 gallons of water per minute in food processing plant, blends with landscape.

FOSTER WHEELER CORPORATION 165 BROADWAY

cooling tower

Induced-draft 6-cell Cooling Tower in oil refinery cools 10,300 gallons of water per minute.



Seven Cooling Towers cool more than 180,000 gallons of water per minute in large power plant.

...TO THE LARGEST

Whatever the application—a "package" type on a department store roof in New York City, a twenty-cell tower for a power plant in Arkansas, or a large unit for a chemical plant in India, Foster Wheeler Cooling Towers can be depended on to deliver full capacity in year-round service.

A Foster Wheeler Cooling Tower is your best guarantee of a constant supply of cooling water for steam power plants, processing, air conditioning, or other uses. Regardless of size, the same engineering and construction excellence, the same attention to detail and the same quality of materials go into every Foster Wheeler installation.

NEW YORK 6, NEW YORK

FOSTER WHEELER

new bulletins and catalogs

Be sure to order your free copy of these booklets — they're the latest information published by leading manufacturers. Use the postage-free order cards on Page 85. Just list the Key Letters of the bulletins you want in the spaces provided on cards

BOILERS, AUXILIARIES, ACCESSORIES

Spreader Stokers (A). Complete line of underfeed and overfeed spreader stokers are covered in bulletins now available. Economy and dependability along with features developed over the past 50 years are embodied in the various designs. Burn all grades of coal without expensive preparation. Efficiencies and capacities of your present boiler may be raised to new standards through the use of stokers according to the bulletins. Detroit Stoker Co.

Burners (B). Combination gas and oil burners, designed for boilers and process furnaces where maximum heat release at low excess air and high heat density place a premium on reliable burner performance, are covered in 4-page bulletin. Series Y and YC burn any commercial fuel oil and any gas at reasonable pressure says 4-page bulletin. Other features along with a sectional drawing and a Btu capacity curve given. John Zink Co.

Electrode Steam Boilers (C). Let Speedylectric put steam to work for you. Designed to hold exact steam pressure and temperature, this line of electrode steam boilers are briefly described in 4-page folder. Refers you to bulletin for more specific information. Pressures up to 500 psi and volumes to 750 lb of steam per hr. Livingston Engineering Co.

High-Temperature Alloy Guide (D). Engineers and metallurgists who design or specify equipment for high-temperature use will find this completely revised, up-to-the-minute, 96-page book an invaluable aid in the selection of alloys that were specially developed to meet the exacting demands of elevated operating temperatures. Two new cobalt-base alloys are described in addition to sections on each alloy. Recommended uses, chemical composition, and physical and mechanical properties in both tabular and graphic form are given. Nine pages of graphs compare the mechanical properties of the various alloys. Age-hardening data and fabrication procedures are also included. Haynes Stellite Div. Union Carbide & Carbon Corp.

Feedwater Heater (E). If you operate a power plant of 300 hp or less you will be interested in this junior-size all-steel feedwater heater. 2-page bulletin gives all the details. Photographs, cutaway views and dimensional diagrams illustrate the bulletin. The Swartwout Co.

Steam Specialties (F). Complete descriptive matter on steam and air traps, pressure reducing valves, pump governors, pressure regulators, boiler feed controls and temperature regulators is contained in 33-page catalog. Included are such data for sizing this equipment as trap capacity tables, reducing valve selection charts, reducing valve capacities etc. The C. E. Squires Co.

Stokers (G). Concentration of thought, effort and resources of a large organization on the production of a single product—stokers—results in a perfection of design and manufacture of outstanding value, says 24-page bulletin that deals with single retort underfeed type. Let Detroit show you just how efficient and economical their LoStoker operates. Booklet is packed with cutaway views, photos, drawings and tables. Series of case histories show actual dollar savings. Detroit Stoker Co.

Mechanical Draft Fans (H). For over 40 years this company has specialized in fans for the most severe service. Catalog containing 20 pages describes fans for both forced and induced draft. Illustrated with drawings of typical fan types and installation photos. Includes performance curves, construction details, drive arrangements and mounting methods. The Green Fuel Economizer Co., Inc.

Plastic Fire Brick (I). Have you investigated the advantages of plastic fire brick for certain installations? "The Inside Story of Plastic Fire Brick", a 44-page catalog which should interest every boiler man, points out where and how the product should be used. There are chapters on anchors, installations, specifications, specialties, and five pages of engineering data. Photographs and diagrams illustrate all phases from manufacture to final installation. Laclede-Christy Co.

Blowoff Valves (J). Even under modern conditions of high operating pressures with continuous blow-down systems, evaporated make-up water and condensate returns, good manually-operated blowoff valves are necessary to insure adequate removal of suspended solids. Complete details covering high pressure (400 to 2500 lb) valves will be found in 24-page bulletin. Includes two types: sliding plunger, and metal-to-metal seat and disc. Features, styles for different pressures, dimensions, materials, specifications, are shown. Yarnall-Waring Co.

Vapor Purifiers (K). Entrainment problems in steam, vapor and air applications are easily solved with the help of this 8-page engineering manual. Contains convenient tables and formulas for selection of correct purifier sizes in addition to formulas used to calculate volume, actual flow, velocity and pressure drop. Molecular weights of common vapors and gases are provided along with additional data. Cutaway views show the centrifugal principle of equipment. Photographs and drawings demonstrate applications in boilers, receivers, and for line use. The Centrifix Corp.

PRIME MOVERS: DIESELS, TURBINES, COMPRESSORS

Diesel Engines (L). Chiefly used to drive generators, pumping on oil or gas lines, water pumping and other stationary power services, these 4-cycle, 17-in. bore, 20-in. stroke engines have a speed range from 257 to 375 rpm. They have hp ratings ranging from 710 to 2,080 hp. 4-page bulletin includes design features and specifications, cross sectional drawings, performance curves, and ratings. The Baldwin-Lima-Hamilton Corp.

Portable Compressor (M). "More Worth in Worthington" means just that—even in catalogs. New, two-staged, air-cooled, 30 cu ft capacity, portable air compressor is announced in illustrated bulletin. Completely covered are features, equipment and specifications. Available in trailer or hand truck models. Worthington Pump & Machinery Corp.

Diesel Engines (N). Engines that have a 12-¾ in. bore, 15½ in. stroke, and a speed range from 360 to 625 rpm are covered in 4-page bulletin. Design features and specifications; performance curves and ratings which range from 430 to 1500 hp are shown. Illustrations include cross sections, dimensional drawings and rating charts. The Baldwin Locomotive Works.

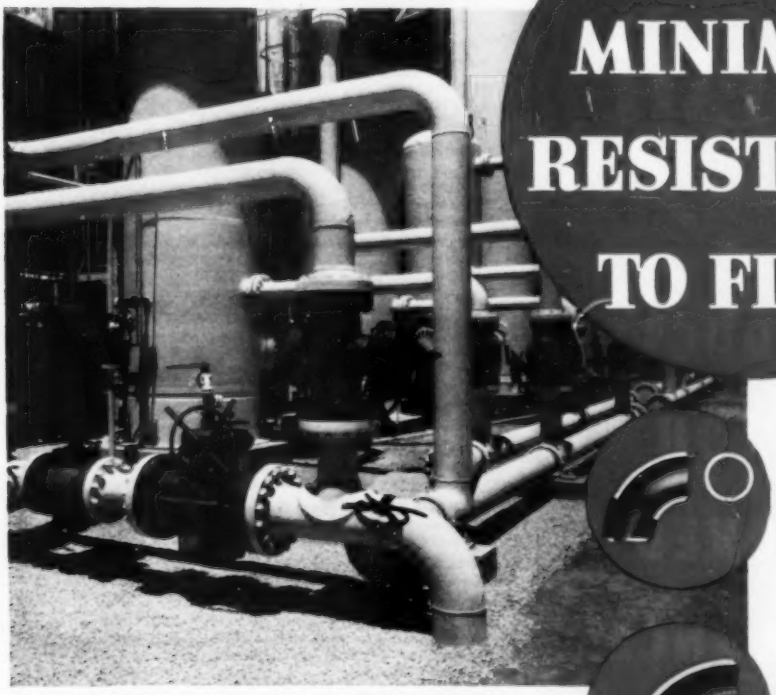
Diesel Engines (O). Here is a 28-page booklet entitled "10 Questions to Ask a Diesel Engine Salesman". The booklet asks and answers 10 questions pertaining to diesel engine design and gives full mechanical details on a line of engines. Murphy Diesel Co.

Turbines (P). Standardized steam turbine units are covered in 16-page bulletin. Six sizes are shown—11,500, 15,000, 20,000, 30,000, 40,000 and 60,000 kw—and the recommended 90,000 kw turbine. Features and accessories are listed along with bills of material for the hydrogen-cooled and the air-cooled generators. The excitation system is also described. Allis-Chalmers Mfg. Co.

(Continued on page 24)

Grinnell Welding Fittings for

MINIMUM RESISTANCE TO FLOW



Grinnell Welding Fittings on towers of natural gasoline plant.

Any qualified welder can make welds quickly and easily with Grinnell welding fittings. These fittings are made by a hydraulic forging process that assures uniform wall thickness at all points and true circularity throughout. Of seamless, one-piece construction, they can be cut at any angle to match up with standard weight, extra strong and heavier wall pipe in I. D. or O. D. sizes. Pressure-temperature ratings are equal to or greater than those of seamless steel pipe. Grinnell welding fittings are process stress-relieved.

Full data on the complete line of Grinnell carbon steel butt welding fittings and forged steel flanges is contained in the Grinnell Welding Fittings Catalog.

SEND FOR THIS CATALOG

TRUE CIRCULAR SECTION

True circular section at all points makes a Grinnell fitting easy to align and weld . . . no distortion or flattening to affect flow adversely.

FULL EFFECTIVE RADIUS

Pressure loss through Grinnell welding elbows is held to a minimum because of the full, effective sweep of the radius.

SMOOTH, CLEAN INSIDE SURFACE

Grinnell fittings have uniformly smooth inner walls . . . no waves or ridges to cause turbulence or accelerate erosion or corrosion. No pockets to trap solids or foreign matter.

EASY, SWEEPING TURNS

In Grinnell welding tees, the corners where the outlet joins the run are well-rounded and perfectly smooth to minimize resistance to flow and to prevent trapping.

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago
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JOB PROVED

SUN PRODUCTS OFFER YOU "JOB PROVED" PERFORMANCE

Sun's wide selection of "Job Proved" petroleum products, plus the vast experience of Sun Engineers, can help you cut costs, step up production, and improve quality. Every Sun product, after its development in the laboratory, must pass rigid and exhaustive tests in actual use. When the worth of the product has been completely demonstrated in this way, then—and then only—it is given the "Job Proved" stamp and offered for sale. Detailed product information and the help of Sun Engineers are yours for the asking. Call your local Sun Office.

SUN OIL COMPANY
PHILADELPHIA 3, PA.
Sun Oil Company, Ltd., Toronto and Montreal

INDUSTRIAL OILS

Original charge of Sunvis as good as new after three years' use in hydraulic press.

SUNVIS 900 OILS—Unexcelled for turbine lubrication, for use as a hydraulic medium, for circulating systems and similar applications requiring longest possible oil life, plus maximum protection to equipment. Sunvis 900 Oils have a high viscosity index and uniform 0°F. pour point, and are fortified against corrosion and oxidation.

SUNVIS OILS—Give long, trouble-free service in all types of industrial reservoirs and circulating systems operating at normal temperatures. Sunvis Oils have uniform high viscosity index, low pour point, and low carbon content.

SUNVIS H.D. 700 OILS—For internal combustion engines operating under heavy-duty conditions, or where hydraulic valve-lifters are used; for circulating systems and other industrial applications where contamination is a factor. The additives in Sunvis H.D. 700 Oils supply detergency, and minimize oxidation and corrosion.

SUNVIS 800 OILS—Special heavy-duty lubricating oils used in railroad diesel engines equipped with silver-alloy bearings.

SUNVIS 2200 AND SUNVIS 2300—Heavy-Duty Supplement #1 and Supplement #2 quality oils respectively. For use in diesel engines where high-sulfur fuels may be encountered.

DYNAVIS OILS—For internal combustion engines operating at moderate loads and speeds. These low-pour-point, high-viscosity-index, inhibited oils help prevent formation of harmful corrosive and sludge-forming acids.

CIRCO OILS—Straight mineral oils for general lubrication of industrial machinery. Unsurpassed for once-through applications, regardless of operating temperatures.

SUNTAC OILS—Recommended for general lubrication of all machines subjected to sudden shocks and load reversals. Compounded to increase adhesiveness, Suntac Oils cling to bearing surfaces and supply constant, superior lubrication.

STEAM CYLINDER OILS—Lubricants of high flash and fire point for saturated or superheated steam conditions and for worm gear speed-reduction units.

SUNOCO WAY LUBRICANT—Eliminates "stick-slip" of tables and scoring of ways. Noncorrosive, with outstanding metalwetting and adhesive properties, ample viscosity and E.P. qualities. Approved by 36 leading machine tool manufacturers.

ROCK DRILL OIL—High-film-strength oil for use in jackhammers, stopers, drifters, and similar equipment.

INDUSTRIAL GREASES

Sun grease increases steel mill production by cutting bearing failures 92%.

SUN GUN GREASES—Smooth greases made with medium-viscosity oil. Stable under pressure in power and booster guns.

"JOB PROVED" IN EVERY INDUSTRY

SUN

SUN ADHESIVE PRESSURE GREASES—Won't drip or splash. Excellent lubricants for open-gear applications.

SUN DARK PRESSURE-SYSTEM GREASES—For power-driven central grease lubricating systems in heavy industries. Also used as "medium cup greases."

SUN MINE CAR GREASES—Available in several grades. Suitable for both antifriction bearings and plain-bearing cavity-type wheels.

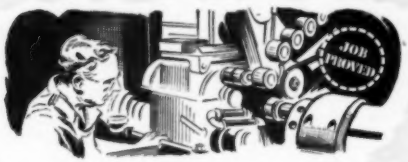
SUN MINING MACHINE LUBRICANT—Semifluid. For use where a light but adhesive grease is required. Resists separation and decomposition.

SUN ROLLER BEARING GREASES—For use on electric motors and generators and high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS—Black adhesive open-gear compounds and wire-cable greases. Recommended for power presses, mining machinery, worm reduction mills, crushers, pump gears, etc.

SUNOCO TRACTOR ROLLER COMPOUND—For crawler-type tractors. Provides good lubrication with exceptional sealing qualities.

METALWORKING OILS



Ball bearing manufacturer finds that Sunicut increases tool life 15%, eliminates sludging.

SUNICUT—Straight (non-emulsifiable) transparent cutting oils. Various grades for automatic screw machines and heavy-duty machining operations. Permit high speed production with excellent finishes, long tool life.

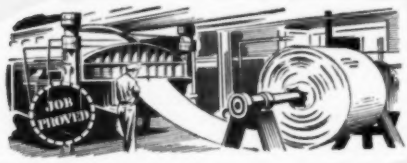
SUNOCO EMULSIFYING CUTTING OIL—An emulsifiable oil which produces a stable white emulsion. Efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and nonferrous metals. It is also an excellent grinding coolant. Available in heavy-duty grades too.

SUN QUENCHING OILS—Specially refined oils designed to aid development of maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel. Because of their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum, brass, and copper.

RUBBER-PROCESS AIDS



Two Sun rubber-process aids save manufacturer $6,000 a year by taking the place of five competitive products.

CIRCOSOL-2XH—An elasticator and process aid for natural rubber and especially for GR-S. Outstanding for sponge rubber.

CIRCO LIGHT PROCESS-AID—A processing agent and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber. Used for GR-S to some extent.

SUNDEX-53—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established process aid for rubber footwear stocks and semihard rubbers.

CIRCOMAR-5AA—A dark-colored product for processing natural and GR-S rubber used in tire-making. Also used in reclaiming natural-rubber scrap. Replaces asphalt fluxes. Free-flowing at room temperature.

REFRIGERATION OILS

Hotel turns to Sunisо for its ice-making equipment; eliminates separation troubles, cuts oil costs 20%.

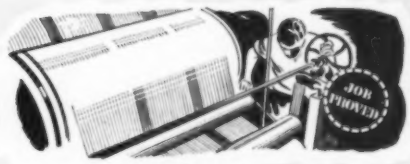
SUNISO REFRIGERATION OILS—High-quality oils having extremely low pour points, extremely low wax-separating characteristics, a high degree of stability, and long life. Initially neutral and resistant to formation of detrimental acids. Suniso grades are available to meet all low, normal, and high temperature conditions. The most widely used oils in refrigerating and air-conditioning.

SUNOCO WAXES

Waxes, "tailor made" to provide the exact properties demanded by different industries, are now available from Sun's new multimillion-dollar wax plant. Revolutionary manufacturing methods make it possible to retain only the wax portions desired for a particular use, while discarding those which might be detrimental.

Sunoco Waxes are precision-controlled for quality and uniformity of *all* physical and chemical characteristics important to the user. The various grades of Sunoco Wax are recommended on the basis of their ability to give superior performance on *the specific job.*

TEXTILE OILS



Sunotex replaces three formula components in textile mill; also saves 25% on costs.

SUNOTEX TEXTILE-PROCESS AIDS—Designed to impart desired additional properties to various fibers during their processing from the raw state into a manufactured product. All Sunotex textile-process aids are emulsifiable in water. Highest rating in Fade-Ometer tests.

SUN COTTON CONDITIONERS—Processing materials which prevent waste by cutting down excessive amounts of fly (fine air-borne lint particles).

SUN ASBESTOS FIBER CONDITIONER—Sprayed on asbestos during processing to keep fibers from being damaged or broken down. Harmful dust is minimized when this product is used.

SUN CORDAGE OILS—Generally used alone, but adaptable to various formulas used by cordage manufacturers. Selected products, highly compatible with additives.

SUNOTEX MACHINE OIL—One lubricant for nearly every kind of textile machine. A high-quality mineral oil and additive combination which prevents rust, clings to moving parts, and minimizes wear. Scours out of *all kinds* of fabrics easily and completely.

ADDITIONAL INDUSTRIAL PRODUCTS

SUN SOLVENTS—Sun Spirits for the thinning of paints, varnishes, and enamels, for metal-cleaning, and certain types of processing and extraction ... a pure, water-white petroleum solvent free of corrosive sulfur. Other Sun solvents with special properties are available for the chemical industry.

SUN LEATHER OILS—Petroleum-base leather oils. Used for obtaining the desired tensile strength, proper temper, and controlled moisture content. Maintain a light even color, mix well, and distribute evenly.

INDUSTRIAL PRODUCTS

SUNOCO®

(Continued from page 20)

Compressors (Q). Latest improvements in design including anti-friction roller bearings throughout these horizontal duplex motor-driven Class O-CE compressors are shown in 26-page bulletin. Cooler operation, better lubrication and higher efficiency are said to result from the improvements. Booklet gives all details on construction, lubrication, cylinder design and performance, regulation and other data. Cross section and exploded views illustrate the book. Chicago Pneumatic Tool Co.

WATER AND LIQUID TREATMENT

Ion Exchange Systems (R). Systems ranging from 30 to 1000 gph are covered in folio containing catalog sheets and other pertinent information. Performance charts enable you to figure the actual chemical costs of operating particular models under your own raw water conditions. In addition, sheets show both working diagrams and photographs of the demineralizers along with specification charts and complete description of parts. Penfield Mfg. Co., Inc.

Chlorinizer (S). High capacity visible flow chlorinizer, designed to meter chlorine gas accurately at rates from 100 to 6000 lb per day, is pictured and described in 4-page bulletin. The many features are listed and a cutaway drawing shows the functioning parts. Easily read diagram shows how the apparatus operates. There also is a full discussion on operation, safety features, rate of flow indicator, maintenance costs and installation. Builders-Providence, Inc.

Boiler Water Tests (T). Quick method for conductometric determination of solids in boiler water or condensate is described and illustrated in 6-page bulletin. Shows equipment which includes conductivity meter, dial thermometer, conductivity cylinder and reagent. Gives basic principles, ranges, procedures, and method of checking and maintainance. Hall Laboratories, Inc.

Scraper Strainers (U). Motor-driven scraper blade inside the cylindrical strainer screen rotates like a worm gear and scrapes off the dirt as quickly as it is trapped without interruption of flow. 2-page bulletin gives all information complete with photographs and diagrams. Sarco Co., Inc.

ELECTRICAL EQUIPMENT

Enclosed Non-Ventilated Motors (V). Having electric motor trouble caused by dust, dirt, abrasive particles, metal turnings, or corrosive vapors? Here is a totally enclosed non-ventilated motor specially designed for such conditions. In 4-page bulletin you get the whole story including design and construction features, frame sizes, cutaway views and photos of component parts. Fairbanks, Morse & Co.

"Packaged" Generators (W). Inside story on the why and how of packaged generators (3.75 to 187 kva) is given in 16-page booklet, "The ABC of Packaged Generators". You'll also find much helpful electrical information, plus charts, graphs, and illustrations to aid in selection and application of these generators. Electric Machinery Co.

Trolley Busway (X). Those who plan and specify electrical installations in operations involving materials handling, portable tools, cranes and hoists will be interested in 64-page catalog describing a prefabricated trolley busway electrical distribution system. Selection of equipment is simplified by the special sections on planning, layouts, installation and specifications. Profusely illustrated with on-the-job photos showing widespread applications in many industries. Feedrail Corp.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

Explosion-Proof Motors (Y). For installations where explosions are a hazard this UL-approved motor should fill the bill. Features are described in 4-page bulletin that also gives definitions of hazardous locations for which the motors are approved. Available in NEMA frames in ratings up to 100 hp. Elliott Co. Crocker-Wheeler Div.

Standardized Substations (Z). Substations built up from standardized components for rural distribution systems are described in 12-page booklet. Shows pictorially six substation arrangements. By folding over extended pages, different combinations of parts are shown on the basic layout. Bills of material dimensions, and symbolic diagrams are given for each combination. Westinghouse Electric Corp.

Air-Cooled Transformers (2A). Safety in avoiding explosion and fire hazards, economy of installation and maintenance are the keynotes of 4-page bulletin on air-cooled distribution transformers. Unit substation, 1000 kva type F, is illustrated and described along with various types of air-cooled and "packaged power" units. Marcus Transformer Co., Inc.

INSTRUMENTS, CONTROLS, RECORDERS

Pyrometer Equipment (2B). Indicators, controllers and protectors that offer accurate temperature indication, close temperature control and positive protection for furnaces, ovens and kilns are illustrated and described in 8-page bulletin. Recommended applications are given as are detailed explanations of design and construction features. Photographs of component parts show how precision is combined with ruggedness. Installation and servicing information included. General Electric Co.

X-Ray Photometer (2C). Theory of operation, principal components, and operating procedure of the X-ray photometer for chemical analyses by X-ray absorption are explained in 8-page bulletin. Lists applications for the instrument in the petroleum and chemical industries. General Electric Co.

Volt-Ammeter (2D). Functions of pocket-size snap-on volt-ammeter are described in 16-page manual. Explains how to use it and how to read the scales. Some of the many jobs on which the instrument can save time and trouble are shown. Pyramid Instrument Corp.

Electronic Master Controls (2E). Complete freedom of control centralization, simplified and smaller control panels, elimination of transmission lags, no panel piping, greater application flexibility, reduced maintenance—these and many more advantages are cited as features of a newly-designed electronic master control system. Full details are given in 8-page bulletin along with photos and circuit diagrams that show how the system operates on both automatic and manual control. Republic Flow Meters Co.

Phase Sequence Indicator (2F). If you work with polyphase electrical circuits you need this pocket-size phase sequence indicator. Complete information on characteristics and uses is given in 2-page bulletin. Operating instructions and an actual-size photo are included. Associated Research, Inc.

Instruments (2G). Controlling, recording, and indicating instruments for temperature and pressure applications are presented in a series of five catalogs that cover industrial, dial and indicating thermometers, pressure gages and recorders, and temperature controllers. Catalogs are complete in all descriptive details, clearly illustrated with photographs and diagrams. They are indexed for quick reference; sized and perforated for inclusion in ring binders. Gotham Instruments Div. of American Machine & Metals, Inc.

Engine Hour Meters (2H). Most modern engineers think in terms of hours when it concerns internal combustion engine maintenance. Engine hour meters tell at a glance the hours and minutes of engine operation. Complete information including installation instructions and diagrams is found in 8-page house organ. John W. Hobbs Corp.

MATERIAL HANDLING

Dry Chemical Feeder (2J). "Midget" weighing feeder with capacity from a few cu in. to 3 cu ft per min and feeding range of 100 to 1 is described in 8-page bulletin. Curves show limits of accuracy and illustrations show component parts of the feeder along with dimension drawings and installation photographs. Omega Machine Co.

Standardized Conveyer Units (2K). Revised 24-page bulletin gives detailed information on eleven standardized power and gravity units. Gives you selection recommendations, construction and design features, specifications, layouts, working diagrams, tables showing load capacities per hp at horizontal or inclined planes, and a series of application photographs. Standard Conveyor Co.

Hold-Back (2L). Simple, rugged unit mounted on conveyer head shaft extension prevents disastrous reversal of loaded conveyers or bucket elevators

(Continued on page 104)

POWER FROM EVERY PLY

Condor COMPENSATED BELT

Users tell us Compensated Belts outlast ordinary transmission belts—as much as 3 to 4 times on some drives. • • • There are sound engineering reasons for this. With our patented Compensation construction, as diagramed on the *right* in panel above, you get more power, more belt-life, because each ply pulls an equal share of load around the pulley. • • • Longer life and trouble-free service are assured, as Compensation prevents outer ply ruptures, fastener troubles, ply separation, which often occur in regular belts as diagramed at *left* above. Wire for Bulletin 6808-J, which explains these and other features. • • • Extra long life is also engineered into R/M hose, V-belts and conveyor belts. See your R/M distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

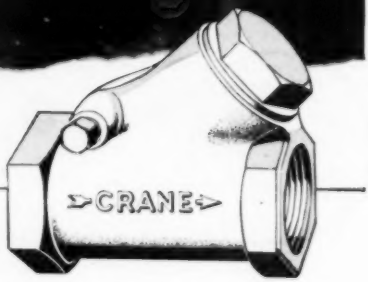
Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

More **CRANE VALVES** are used than any other make

Crane "Pulsator" test of check valve endurance. By continuous sudden reversals of air pressure, valve discs are slammed open and shut at rates up to several hundred cycles per minute.

How Many Checks in a Good Check Valve?

You don't buy them that way, but that's what finally determines the value of check valves in your pipe lines. That's why Crane is so completely equipped for accurately pre-testing valve performance. For instance, "wearability" of check valves is tested by opening and closing the valves continuously on various fluids under conditions of actual service. Special equipment is used to accelerate these tests to equal many years' service in a short period. Countless tests like this—of materials, designs, and finished products—insure the superior performance values that mean lower piping costs for users of all Crane valves and fittings.



This new regrinding Brass Swing Check design typifies Crane's continuing product development for better valve performance, lower piping maintenance costs. For increased flow capacity . . . for fast, positive closure on backflow . . . for easier servicing without removing valve from line . . . get a demonstration of these 200 and 300-Pound Y-Pattern Check Valves. Phone your Crane Representative, or ask for literature.

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

NOW . . . Coppus-Dennis FANMIX Action REVOLUTIONIZES OIL BURNER PERFORMANCE 6 WAYS!

1. INCREASES BOILER RATINGS because all of your furnace space is used for combustion . . . none for mixing.

2. STEPS UP FUEL EFFICIENCY because complete combustion is guaranteed with 5% to 10% excess air.

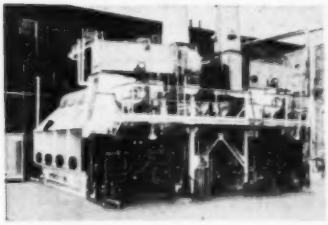
3. GETS RID OF "HOT SPOTS" because continuous explosion kills torch action and disperses heat uniformly.

4. ELIMINATES FORCED DRAFT EQUIPMENT because FANMIX action itself overcomes the entire draft loss across the burners.

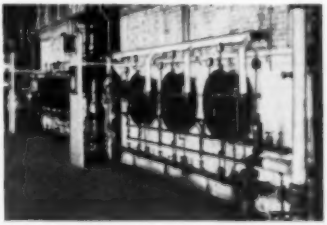
5. CUTS STACK REQUIREMENTS because the forced draft created by FANMIX action calls for less furnace draft.

6. REDUCES COKING OF ATOMIZERS because their tips are air-cooled by the fan blades to a point well below the coking temperature.

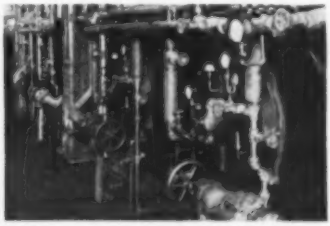
COPPUS-DENNIS FANMIX OIL BURNERS, thoroughly proved in important installations for more than two years, utilize jet reaction of steam-atomized oil to rotate a fan which is an integral part of the burner. Automatically adjusted proportion of high velocity air passes at right angles through the sheet of atomized oil to create an ideal mixture for fast, complete combustion — peak efficiency.



COMMERCIAL SOLVENTS CORP. plant, Terre Haute, Indiana, utilizes Coppus-Dennis FANMIX Oil Burners to fire two fully automatic 250 hp steam generators. Installed early in 1948, these two units have since been supplemented by a third.



AMERICAN WOOLEN CO., in one of its plants, has equipped two 1000 hp boilers with six Coppus-Dennis FANMIX Oil Burners.



BROCKTON EDISON CO. relies on four Coppus-Dennis FANMIX Oil Burners in its plant in East Bridgewater, Mass.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

INVESTIGATE! If you share in the responsibility for the efficiency of your firm's boiler operations, it will pay you to learn why Coppus-Dennis FANMIX Oil Burners, made to Coppus Blue Ribbon standards of quality, promise such superior performance. Send the coupon today.

Please attach this coupon to your company letterhead

COPPUS ENGINEERING CORPORATION
182 Park Avenue
Worcester 2, Mass.

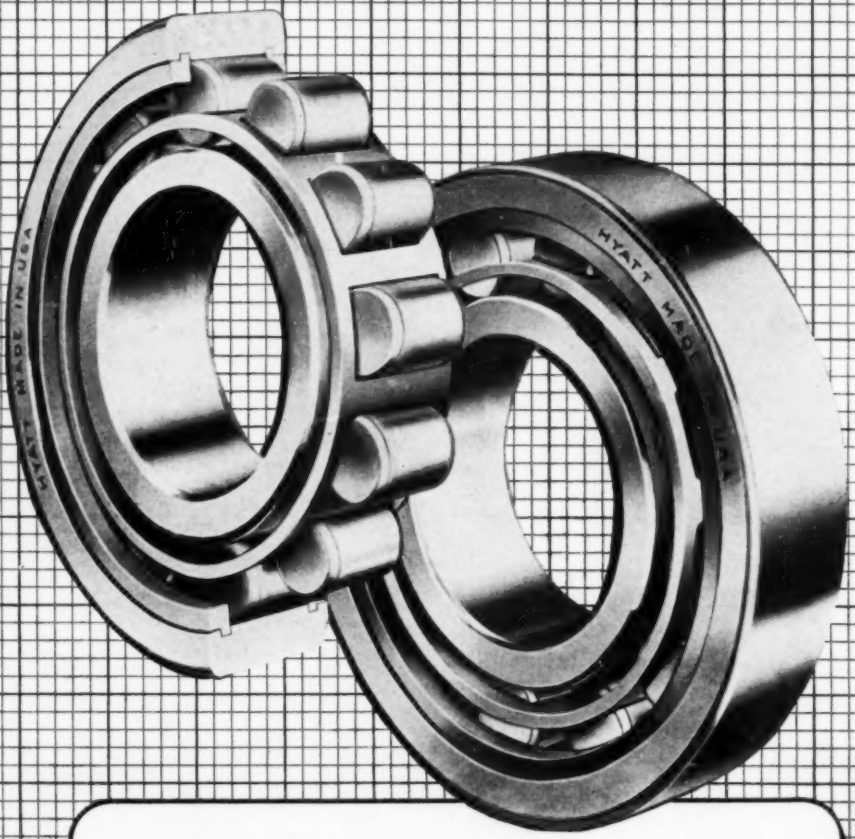
Please send complete data on Coppus-Dennis FANMIX Oil Burners.

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....



HYATTS...to your advantage

Take a good look at what the "specs" say about bearings when you are planning to buy new machines or equipment.

If Hyatt Roller Bearings are built in, then you won't have to give them another thought.

Throughout varied industries—for fifty-eight years—Hyatt Roller Bearings have been preferred equipment with machine builders.

It's to your advantage to buy a Hyatt-equipped machine, because Hyatts do help machines to live longer with a minimum of maintenance and lubrication. The name Hyatt is on each bearing for your protection. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

Bank Deposits or Scale Deposits?

Scale and sludge deposits, carryover, corrosion and high blowdown all result in high boiler operating and maintenance expenses that add to the cost of doing business.

These problems and costs can be eliminated by proper water treatment and controls . . . based upon the conditions that exist in *your* plant. That's where Drew Water Treatment Service starts. And it includes *all* the corrective and preventive measures required for efficient operation.

Drew Service is *specialized* service applied to your specific operating problems . . . designed to reduce your operating expenses. If you'd like to cut costs—as others have—consult the Drew Engineer or write for information.

POWER DREW CHEMICALS

Power Chemicals Division
E. F. DREW & CO., INC.
15 East 26th Street, New York 10, N. Y.

DREW PRODUCTS

Nationwide Service in Boiler Water and Cooling Water Conditioning

Small HEACON DAMPER Applications that Pay for Themselves...

Chart of 24 hour operation mentioned in text

Main Plant of the Passyunk Laundry Philadelphia, Penna.

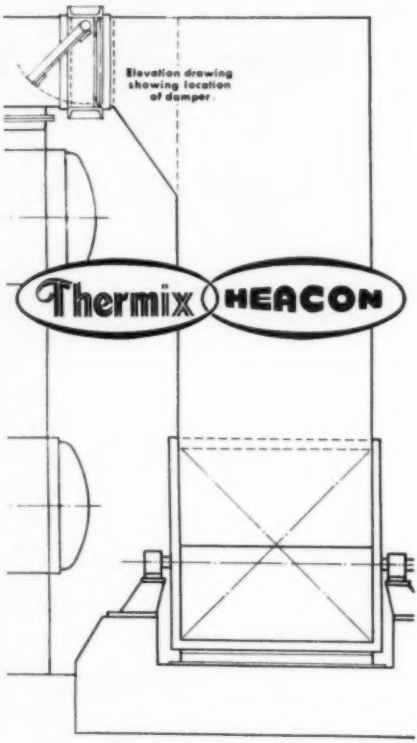
...IN FUEL SAVINGS
...IN REDUCING STARTING TIME LAG
...IN ELIMINATING ATTENDANT COSTS

A 200 H. P. Keeler Boiler supplies power for this modern laundry, operating an engine generator set, pressing machines, ironers and a hot water generator. A Heacon Type L H Damper, located in the duct connecting the outlet of the boiler to a P-D Fan Stack, was installed to maintain pressure during banking periods.

Prior to installation, the boiler was banked at 5:30 P.M., fired to 125 psig at 1:00 A.M. and at 6:30 A.M. available pressure for starting would average 30 psig. Since installation of the Heacon Damper, the oil burners are shut down at 4:45 P.M. and the damper closed. Steam demand is permitted to continue until 5:15 P.M. and the pressure has dropped to 55 psig when the stop valve is closed. This step is necessary to avoid lifting the safety valve. At 7:30 P.M. the residual heat in the setting has raised the pressure to 120 psig and a relief valve opens causing steam to flow to the water heater. This continues until 11:45 P.M. At 6 A.M. when the stop valve is opened, the boiler pressure is 109 psig. This sequence is illustrated by the pressure chart. The fuel saving is obviously considerable. In addition, the cost of a watchman to fire the boiler at 1:00 A.M. is saved and an automatic fire alarm system has reduced insurance rates.

Heacon Dampers are based on an entirely new principle. A Flexible curtain of asbestos conforms to the seals, forming a tight shut-off. This design also permits accurate control, either automatic or manual.

Your critical damper problems, large or small, can be solved by Heacon Dampers, at a cost that will pay for itself in six months. Our engineers will be glad to show you how Heacon Dampers can save you money.



THE THERMIX CORPORATION

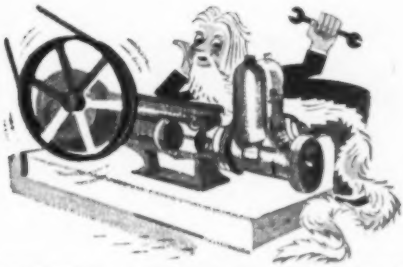
GREENWICH **CONN.**

Canadian Affiliates: T. C. CHOWN, LTD.

1440 St. Catherine St. W., Montreal 25, Quebec • 50 Abell St., Toronto 3, Ontario, Canada

For thousands of years
Orientals have known ramie
as the long-lasting fibre . . .

Now . . . Johns-Manville
makes ramie fibre into
the long-lasting packing . . .



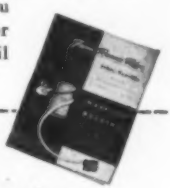
That's why *NAVALON* cuts packing costs to the bone . . .

IF YOU NEED A PACKING for reciprocating service that can take punishment and *last* . . . against fresh or salt water, brine, cold oil, and other cold liquids . . . try Navalon.

Navalon's long-lasting properties are inherited directly from ramie—a fibre that has been known for thousands of years for its strength and its rot-resisting qualities.

Because these long-lasting qualities of ramie—its high tensile strength and its rot-resistance—have been retained in Navalon, and because of a special Johns-Manville process that imparts unique lubricating properties, Navalon is consistently out-performing other packings in cold liquid service. In plant after plant, Navalon is standing up where other packings fail . . . reducing down time . . . and cutting packing costs to the bone!

If you have a tough packing problem, we suggest that you try Navalon. You can get it through your local packing distributor—or if you would like further details, write for folder PK-32A. Just fill in and mail the coupon below.



Johns-Manville
PACKINGS & GASKETS

Johns-Manville
Box 290
New York 16, N. Y.

Please send me your folder on Navalon Packing (PK-32A).

Name_____

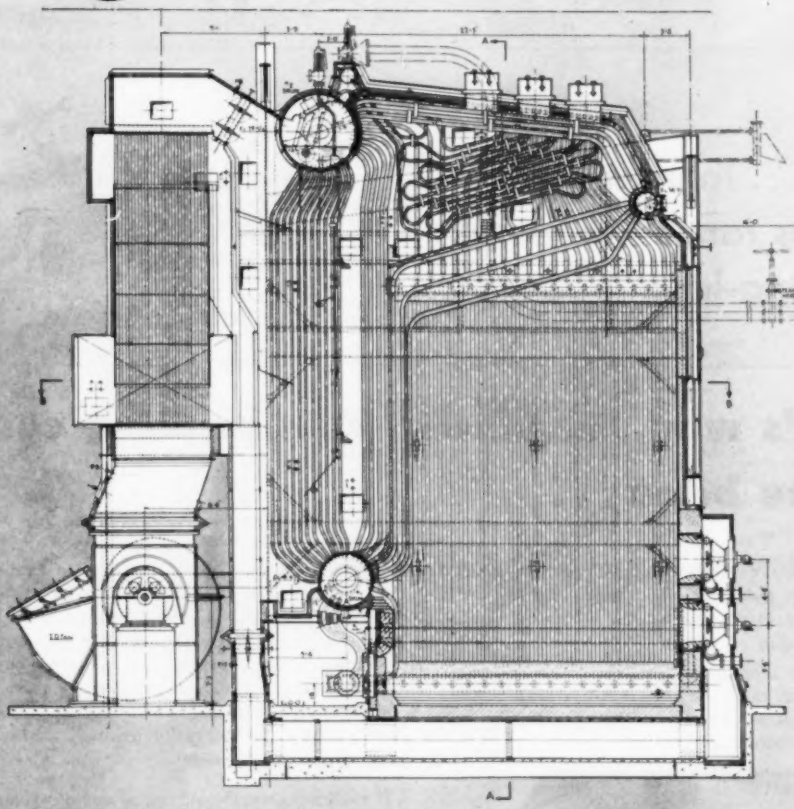
Company_____

Address_____

City_____ State_____

IP-2

Add 5 more RILEY units



Cross Section of the ten 300,000 lbs./hr. Riley gas and oil fired Steam Generating Units of this large chemical plant. These units operate at 500 psig and 750°F. In addition to these ten Riley Units, there are six 450,000 lbs./hr. Riley Units operating at 1425 psig and 900°F.

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Pittsburgh Cleveland Detroit Chicago
Cincinnati Atlanta New Orleans Memphis St. Louis Kansas City St. Paul Tulsa Houston
Denver Salt Lake City Los Angeles Portland Seattle

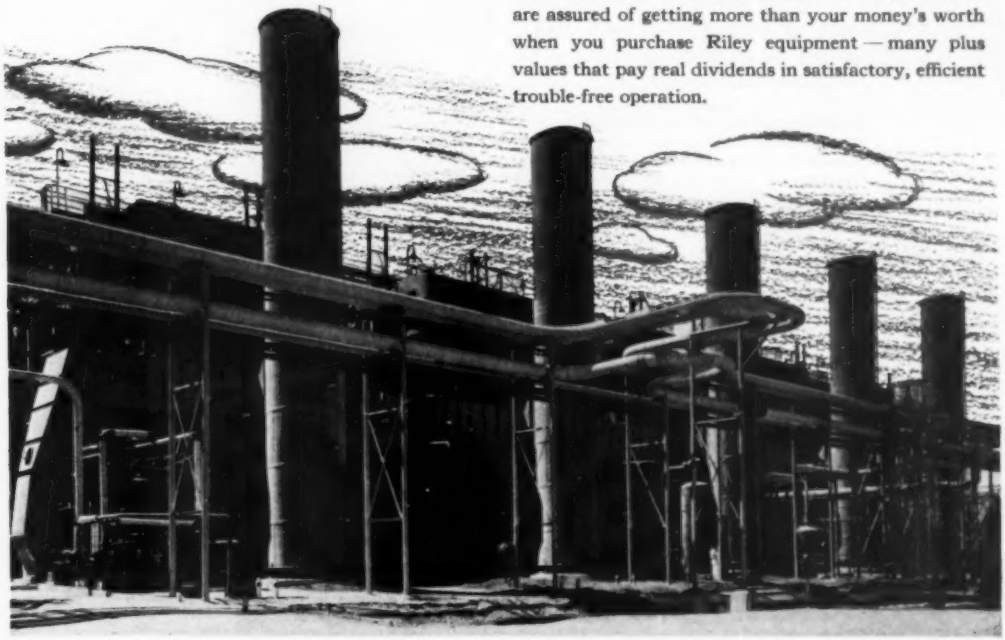
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

...making a total of 10

This will be the South's largest industrial power plant

The first three Riley Units at this large outstanding chemical plant were installed in 1940. Two additional units were installed in 1941, another two in 1946, one more in 1950 and the ninth and tenth units will be installed in 1951. In addition to these ten Riley Units, four more units having a capacity of 450,000 lbs./hr. and operating at 1425 psig—900°F. steam, will be added to the existing two units of this size. These 14 units with a total capacity of 5,700,000 lbs./hr. will make this one of the largest industrial power plants in the south. This company has placed 10 orders with Riley for 18 boiler units.

What better assurance can be provided that you can rely on Riley, than the fact that users invariably come back for more Riley Units when additional capacity is required. Throughout the country, Riley Steam Generating Units are giving such a good account of themselves that when additional units are required in many cases Riley Units are purchased without competition. Because of the regularity with which Riley Units exceed guaranteed efficiency and capacity, you are assured of getting more than your money's worth when you purchase Riley equipment — many plus values that pay real dividends in satisfactory, efficient trouble-free operation.



A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly [illegible] costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLA[illegible]-SETTINGS • AIR HEATERS

NOW!

EDWARD WELDED BONNET UNIVALVES*

for service up to 2500 lb at 1000 F

For high pressure service, especially when temperatures are high and variable too, Edward forged steel Univalves are the logical choice.

Edward Univalves are now regularly built in both 1500 and 2500 lb 1000 F series in all sizes from ½ in. through 2 in.,1½ in. and 2 in. suitable for A.S.M.E. Code blow-off service.

LOOK AT THESE ADVANTAGES . . .

1 LEAKPROOF WELDED BONNET Patented seal welded body-bonnet joint, designed for disassembly if ever necessary. No bonnet joint to leak.

2 PERFECT ALIGNMENT Integral one-piece bonnet with renewable bronze yoke bushing. Special welding fixtures and single set-up machining result in absolute alignment of all working parts.

3 HARD FACED SEAT AND DISK Continuous ring of Stellite applied directly on valve body forms seat, and disk is alloy steel with a Stellite face.

4 LOW PRESSURE DROP Inclined stem construction makes flow passages so straight you can see through them, yet retains globe valve tightness. Pressure drop reduced 25 to 50 per cent, and wear-producing turbulence is at a minimum.

5 FOOLPROOF BACKSEAT Packing isolated to prevent blow-out when repacking under pressure. Backseat and deep cooling chamber protect packing in service.

6 EASY PACKING ADJUSTMENT Through - bolted, accurately guided gland.

AND THESE PLUS FEATURES, TOO . . .

- ✓ *Maximum piping flexibility*
- ✓ *Excess weight eliminated*
- ✓ *Oversize knobbed handwheels*
- ✓ *Re-enforced EValpak* molded packing*
- ✓ *Centerless ground stainless steel EValloy* stems*
- ✓ *Abrasion resistant EValized* junk rings*

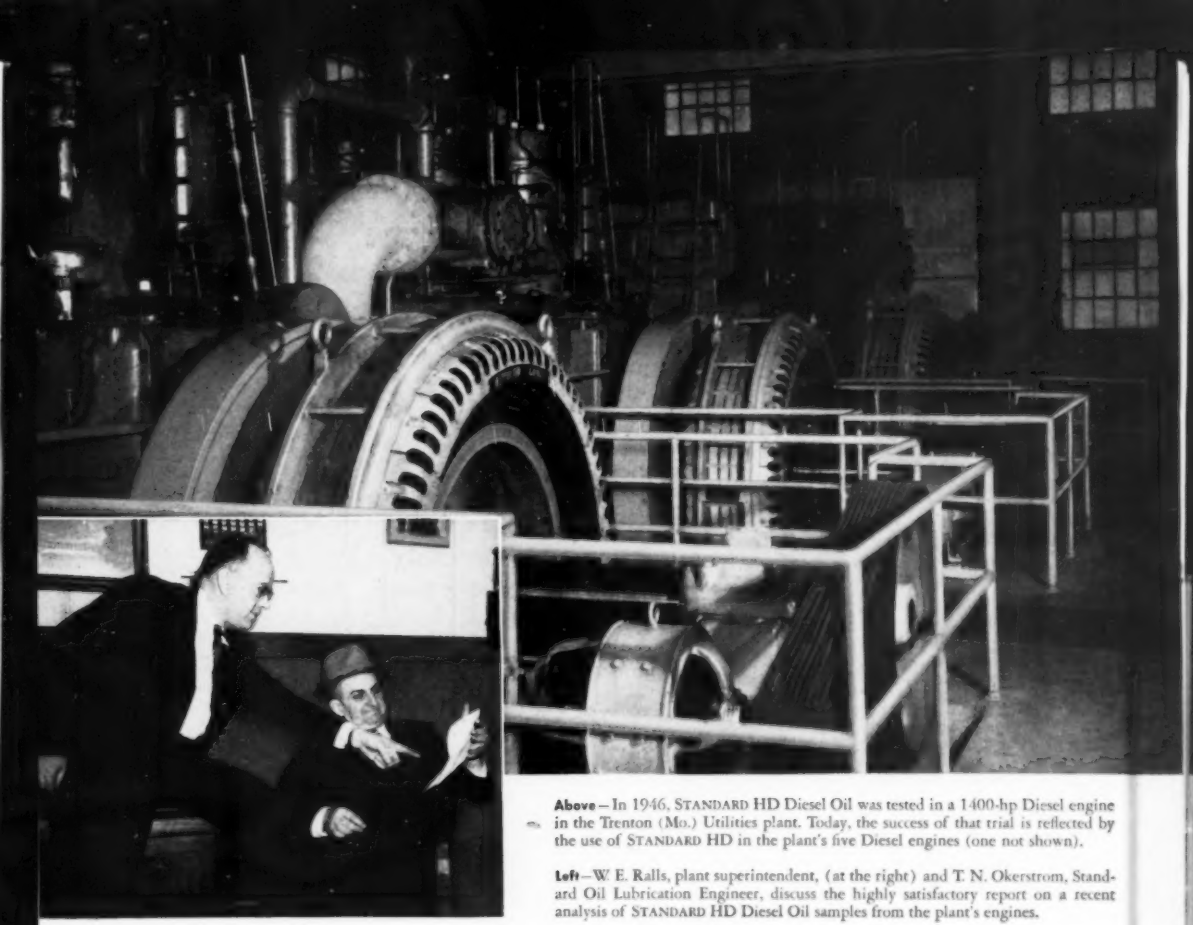
Edward Intex* valves for 1500 lb 1000 F service available in same size range for services where bolted bonnet globe valves are desired.

Write today for new Edward Catalog 12-G6 describing Univalves and Intex Valves.

*Univalves, EValpak, EValloy, EValized and Intex are registered trade marks of Edward Valves, Inc.

Edward Valves, Inc.

SUBSIDIARY OF ROCKWELL MANUFACTURING CO. EAST CHICAGO, INDIANA



Above—In 1946, STANDARD HD Diesel Oil was tested in a 1400-hp Diesel engine in the Trenton (Mo.) Utilities plant. Today, the success of that trial is reflected by the use of STANDARD HD in the plant's five Diesel engines (one not shown).

Left—W. E. Ralls, plant superintendent, (at the right) and T. N. Okerstrom, Standard Oil Lubrication Engineer, discuss the highly satisfactory report on a recent analysis of STANDARD HD Diesel Oil samples from the plant's engines.

One good job leads to another . . . and another . . . and another!

The experience of W. E. Ralls, Superintendent of the Trenton Municipal Utilities plant at Trenton, Missouri, proves once again that reduction of downtime and maintenance is the Diesel operator's way to judge lubricating oil.

After talking with a Standard Oil lubrication specialist about the advantages of STANDARD HD Diesel Oil, Mr. Ralls put the heavy-duty lubricant to a test in the plant's 1400-hp Diesel engine. STANDARD HD came off with flying colors! The clean and trouble-free operation of this unit sold the new lubricant right into the plant's three 650-hp Diesels. When a new 1600-hp engine was installed in 1948 that, too, was filled with STANDARD HD Diesel Oil.

Today, the success of STANDARD HD on one job after another in this plant is reflected in more reliable Diesel operation and lower maintenance costs.

Let a Standard Oil lubrication specialist help you find how STANDARD HD Diesel Oil can reduce maintenance and overhauls. You can reach him quickly and easily by phoning the nearest local Standard Oil (Indiana) office. Or, if you wish, write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD HD
TRADE MARK
Diesel Oil

STANDARD OIL COMPANY (INDIANA)

STANDARD

What
NEW STANOIL'S
longer life means to you.....

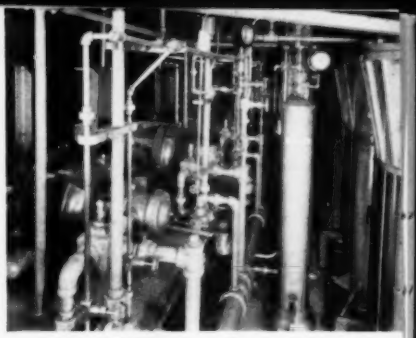
● For fourteen years STANOIL Industrial Oils have proved their ability to handle a wide variety of jobs in midwest plants. Now, these established products have been made better than ever! They offer new and important savings in an even wider variety of equipment because:

1. **Greater oxidation stability** in the New STANOILs enables them to stand up under high temperatures of operation, maintain low acidity for long periods of time, and reduce to the minimum deposits caused by oil oxidation.

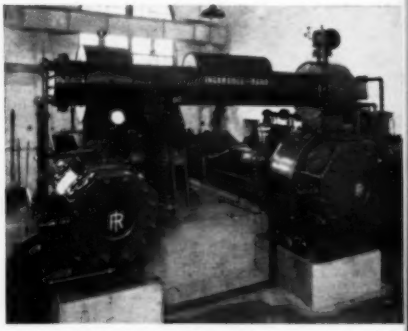
2. **High Viscosity Index and Low Pour Point** enable STANOILs to perform satisfactorily through a wide range of temperatures. They flow readily at low temperatures and do not thin out excessively at high temperatures.

3. **Greater protection against rust** has been provided by the addition of a corrosion inhibitor of an advanced type to all grades of New STANOIL. This inhibitor prevents corrosion trouble by "plating out" on surfaces that tend to rust. New STANOILs have practically put an end to rust and corrosion troubles.

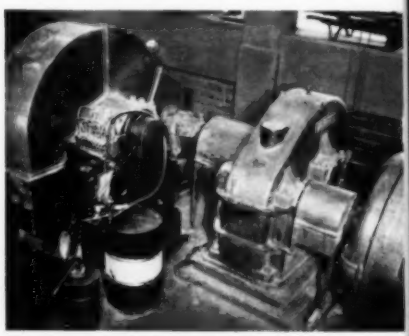
At the right are shown several types of equipment in which the New STANOILs can save you money and maintenance time. A Standard Oil Lubrication specialist will help you find still other applications where versatile STANOILs can replace many special-purpose oils. You can reach this man quickly and easily through your local Standard Oil Company (Indiana) office. Contact him today. Or, if you wish, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



In Hydraulic Systems. Because of the high viscosity index and low pour point of the New STANOILs, they provide smooth operation in hydraulic systems regardless of widely varying temperatures. They also eliminate foaming, which is frequently troublesome in hydraulic operation. Their high oxidation stability eliminates deposits that could cause valve sticking and wear.



In Compressors. Because of the oxidation stability and low carbon-forming characteristics of STANOILs, carbon deposits on valves are reduced in air-compressor operation. The New STANOILs separate readily from water—no troublesome emulsions in compressor crankcases.



In Reduction Gears. Because of STANOIL's resistance to acidity and to deposit formation, gear cases of reduction gears remain clean. The oil may be used for longer periods with no danger of excessive wear of gears and bearings.

STANDARD **STANDARD OIL COMPANY (INDIANA)**

FOR 5-STAR PERFORMANCE

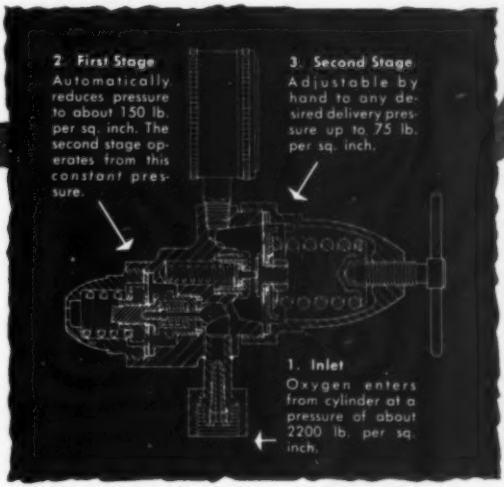
PUROX

Trade-Mark

TWO-STAGE REGULATORS

- ★ ACCURATE
- ★ SENSITIVE
- ★ EFFICIENT
- ★ STURDY
- ★ DEPENDABLE

(Right) Type R-201 Oxygen Regulator (maximum delivery pressure 75 lb. per sq. in.) for all welding and medium cutting. For heavy-duty cutting, use the R-202 (maximum delivery pressure 200 lb. per sq. in.), which is similar in appearance. The R-203 Acetylene Regulator is the companion for both.


2. First Stage
Automatically reduces pressure to about 150 lb. per sq. inch. The second stage operates from this constant pressure.
3. Second Stage
Adjustable by hand to any desired delivery pressure up to 75 lb. per sq. inch.
1. Inlet
Oxygen enters from cylinder at a pressure of about 2200 lb. per sq. inch.

Experienced operators rely on PUROX Regulators to give them the exact pressure and volume of oxygen and acetylene needed to do a first-class job. They know that accuracy and sensitivity in PUROX Regulators depend on large-diameter diaphragms and good engineering design — not on delicate mechanisms that need constant care and adjustment.

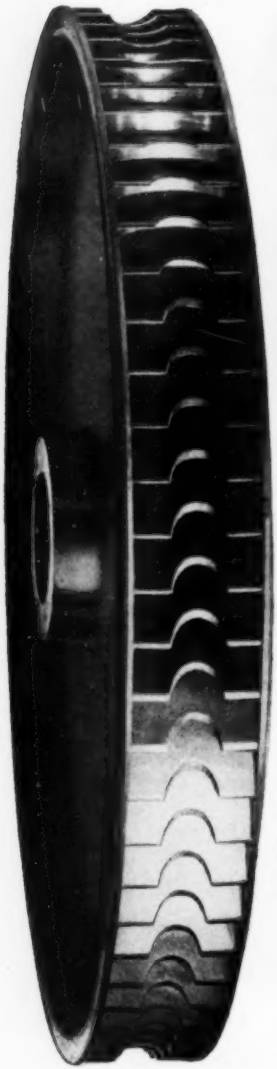
They're familiar with the easy-to-read gauge dials . . . uniform pressure control that permits one-time flame adjustment . . . pressure-forged bodies and caps that give great strength with a high margin of safety and minimum weight . . . the built-in durability that makes PUROX Regulators such dependable performers with so little maintenance.

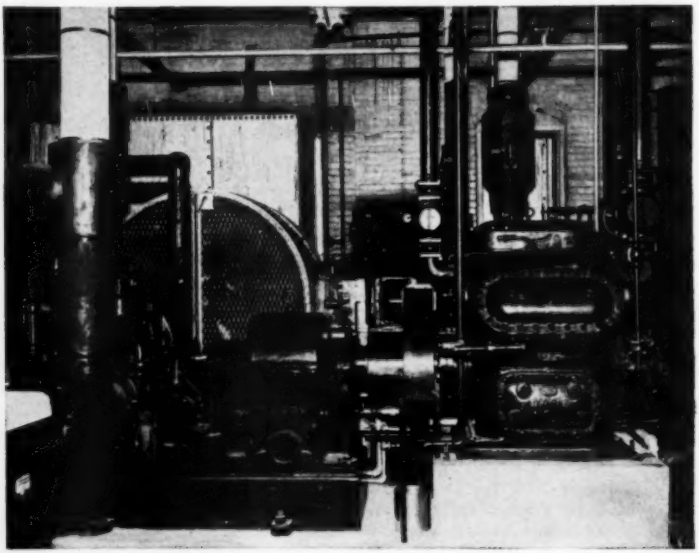
ORDER FROM YOUR LOCAL JOBBER

For jobber's name and free folder describing PUROX apparatus, write to Linde Air Products, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y.

The term "Purox" is a trade-mark of Union Carbide and Carbon Corporation.

the Terry Turbine





Refrigeration Compressor Driven By Terry Turbine

AT HAMPDEN BREWERY

This 150 hp Terry Turbine — at the Willimansett, Mass. plant of the Hampden Brewing Co. — operates at 3800 rpm with a gear reducing it to 720 rpm. It is coupled to a 6 cylinder reciprocating compressor.

The installation is running on steam conditions of 120 psi — 0° superheat, and the steam to the turbine is automatically throttled to maintain a constant 30 psi back pressure for process and heating. The installation was developed by Fred Ophuls & Associates Consulting Engineers.

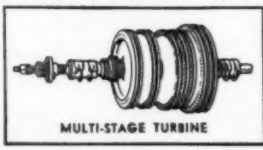
Get more information on the wide range line of Terry Turbines from your local District Representative. There's no obligation for a complete discussion of your specific requirements. Also send for Bulletin S-143 that gives full details.

THE TERRY STEAM TURBINE CO.

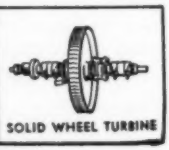
TERRY SQUARE, HARTFORD 1, CONN.

TT-1186

Terry



MULTI-STAGE TURBINE



SOLID WHEEL TURBINE

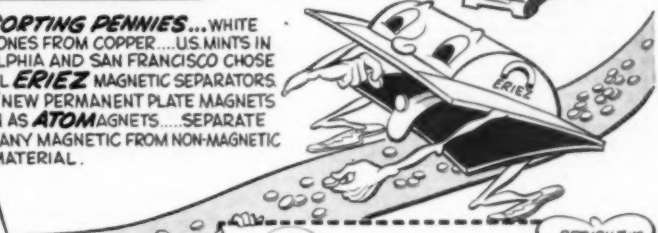
ERIEZ MANUFACTURING CO., ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS

RUBBER GLOVE MAKERS... WERE PLAGUED WITH SMALL HOLES IN THEIR PRODUCT. CAUSE: **TRAMP IRON** SPECKS IN THE LIQUID LATEX RUBBER...REMEDY: AN **ERIEZ** STAINLESS STEEL-BODIED MAGNETIC TRAP IN THE PROCESSING PIPELINE. IRON PASSAGE WAS CHECKED ENTIRELY. WORKS, TOO, IN FOOD LINES OR IN ANY LIQUID FLOW LINE.

PRODUCTION INCREASED 1200% ON ONE OPERATION AT L.C. SMITH AND CORONA TYPEWRITERS, INC. .....

...WHEN **ERIEZ** PERMANENT MAGNETIC PULLEYS WERE PUT IN BELT CONVEYOR LINES TO SEPARATE METAL PARTS FROM TUMBLING STONES, NEW **ERIEZ** ALNICO V **ATOM** MAGNET PULLEYS ARE THE STRONGEST KNOWN!

FOR SORTING PENNIES... WHITE (STEEL) ONES FROM COPPER....US MINTS IN PHILADELPHIA AND SAN FRANCISCO CHOSE POWERFUL **ERIEZ** MAGNETIC SEPARATORS. **ERIEZ** NEW PERMANENT PLATE MAGNETS ...KNOWN AS **ATOM** MAGNETS.....SEPARATE ALMOST ANY MAGNETIC FROM NON-MAGNETIC MATERIAL.



METAL IN CORN FLAKES... CAN BE TOUGH ON TEETH AND STOMACH. TO KEEP ALL METAL OUT OF ITS CEREAL PRODUCTS, *GENERAL MILLS* USES THE R.C.A. ELECTRONIC METAL DETECTOR, SOLD BY **ERIEZ**. IT WARNS AGAINST ANY METAL AS SMALL AS .039" IN DIAMETER!

RETURN THIS COUPON.

ERIEZ MANUFACTURING COMPANY
208 STATE STREET, ERIE, PA.

MY CONTAMINATION OR SEPARATION PROBLEM IS:

_____

_____

PLEASE SEND LITERATURE ☐
HAVE REPRESENTATIVE CALL ☐ PROMPTLY ☐ WHEN IN AREA

NAME _____
TITLE _____
COMPANY NAME _____
STREET _____
CITY _____ ZONE ____ STATE _____

SIB

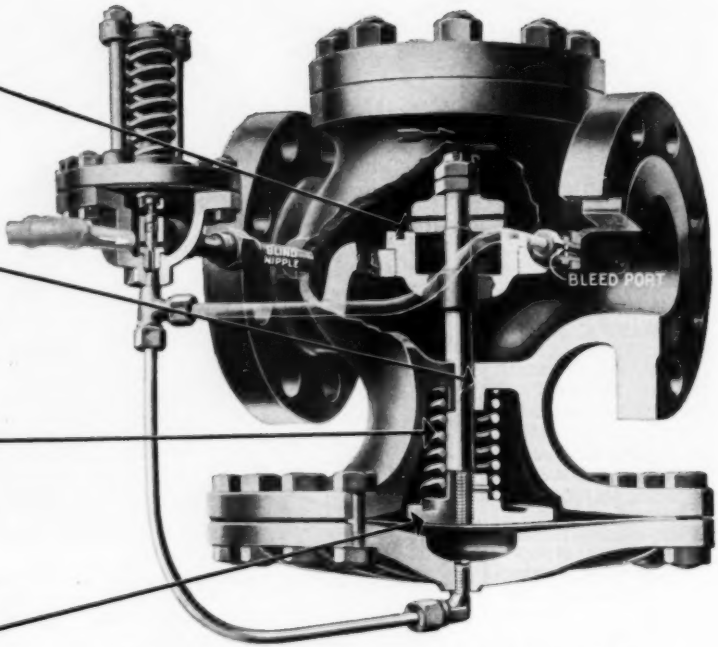
WHY Spence Regulators Outlast The Field

SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. More than *twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

SPRING OUT OF PATH OF STEAM — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

LARGE BALANCED DIAPHRAGM—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.



Spence Type EQ back pressure regulator — operation of main valve is controlled by a sensitive pilot to regulate the initial pressure. Same pilot is used with all sizes of main valves.

The features shown above explain why you profit on every important count with Spence Pressure and Temperature Regulators.

Learn more about these and many other advantages of Spence Regulators by sending for Bulletin 350.

DURABILITY — Spence Regulators perform dependably year after year.

ACCURACY — You can be sure of accurate control for the life of the regulator.

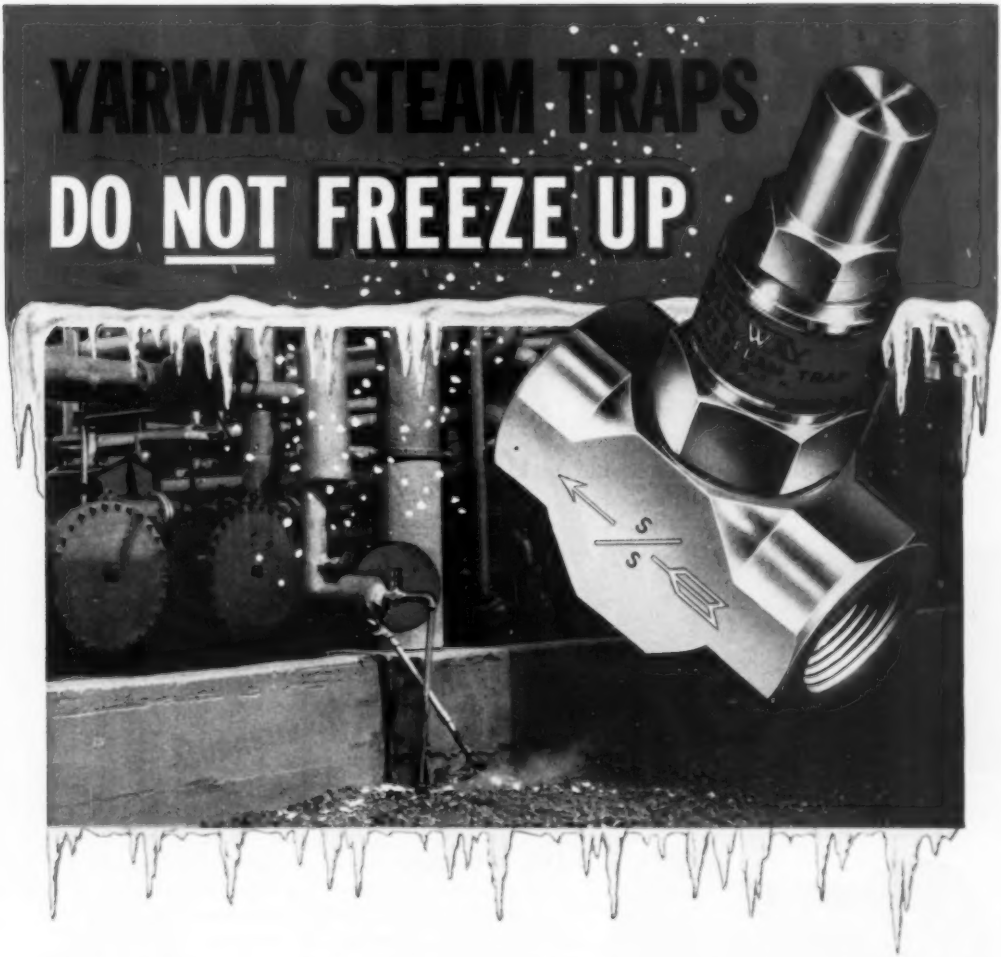
MAINTENANCE — You don't need expensive repairs or special maintenance. That means less down-time, less time and money wasted on replacement of parts.

SZ-110

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence

YARWAY STEAM TRAPS DO NOT FREEZE UP



What if it is freezing cold—your exposed steam traps won't cause you any worry if they're Yarway.

Yarway Impulse Steam Traps don't freeze because condensate does not accumulate. The only moving part—a little valve—is continually testing for condensate and passing it as soon as it forms. It never waits for a trapful to collect. Hence, there's never anything to freeze.

There are other good reasons, too, why more than 650,000 Yarways have been bought for both indoor and outdoor installations.

They get equipment *hotter, sooner.* They are *small in size, light in weight, easy to install and maintain.* They are *good for all pressures.* Construction is *stainless steel.*

Prove these advantages in your own plant at our expense. Try a Yarway *for free.* Call your nearby Yarway distributor or write direct to . . .

YARNALL-WARING COMPANY
109 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

Stainless Steel Body

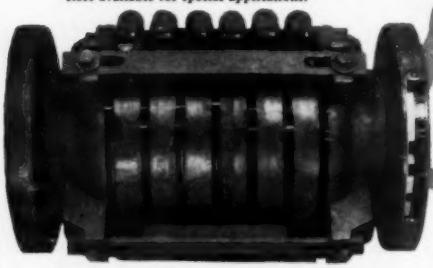
YARWAY IMPULSE STEAM TRAP

HERE'S WHY

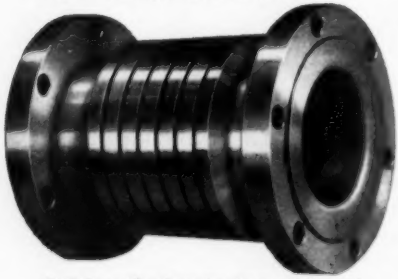
CMH Expansion Joints are preferred by so many piping engineers

- ✓ Space Saving
- ✓ Weight Saving
- ✓ Streamlined Flow
- ✓ Lower Overall Cost
- ✓ Ease of Installation
- ✓ Trouble Free Operation
- ✓ Freedom from Maintenance

CMH Free-Flexing Expansion Joints for pressures to 30 psi; stainless steel or copper; flanges or welding ends; standard sizes to 30" I.D.; larger sizes available for special applications.



CMH Controlled Flexing Expansion Joints for pressures to 300 psi; stainless steel or copper; flanges or welding ends; sizes to 30" I.D.



CMH Flexoniflex Expansion Joints with integral control rings for pressures to 1500 psi; stainless steel and other alloys; standard sizes ⅜" through 6" I.D.; larger sizes also available.

THE PROBLEMS of pipe motion control are reduced to a minimum when you use CMH corrugated type expansion joints. Scientifically formed by advanced methods, they represent the modern, cost-saving, trouble-saving way to control axial, lateral or radial motion in piping or to correct for misalignment.

For new installations or for replacement of obsolete equipment, specify CMH expansion joints. Complete data is given in CMH'S Expansion Joint Design Guide. Write for a copy . . . it's the first step towards eliminating the headaches that are so often a part of pipe-line motion control.

Flexon identifies CMH products that have served industry for over 48 years.

CHICAGO METAL HOSE Corporation

1335 S. Third Avenue • Maywood, Illinois • Plants at Maywood, Elgin and Rock Falls, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH

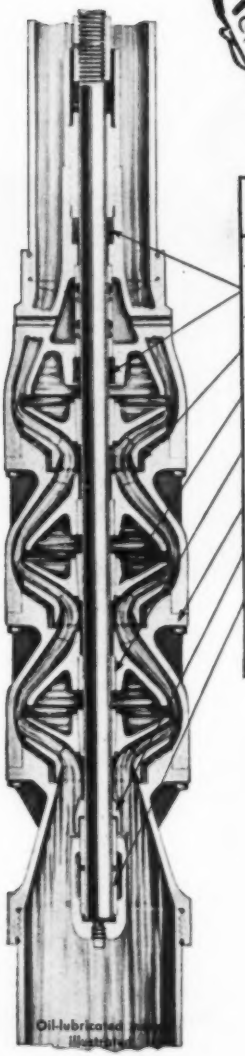
ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

Before you buy a vertical turbine pump

CHECK WORTHINGTON AGAINST THE FIELD!

Chart shows only Worthington gives you all 8 vital design-features as standard equipment



The Ten Leading Makes Of Vertical Turbine Pumps
√ Indicates Feature Is Standard

Standard Features	Worthington Type Q	Pump A	Pump B	Pump C	Pump D	Pump E	Pump F	Pump G	Pump H	Pump I
Seals above and below drain parts (oil-lubricated model)	√									
Wearing rings	√				√			√		
Enclosed impellers	√	√	√	√	√	√		√	√	√
Bronze bushings in bowl assembly	√		√	√	√	√		√	√	√
Flanged and bolted bowls on all sizes	√						√		√	√
Sand collars at both ends of bowl assembly (water-lubricated model)	√	√								
Grease-packed bottom bearing	√	√			√					√
Choice of oil or water lubrication	√	√	√	√	√	√		√		

There's your quick, complete picture of how Worthington Type Q stocks up against competition. Remember — each of the features listed is a proved aid to more efficient pump performance. And only Worthington gives you all of them as standard!

Why settle for anything less than this all-inclusive, ahead-of-the-parade design that assures smoother, lower-cost pumping?

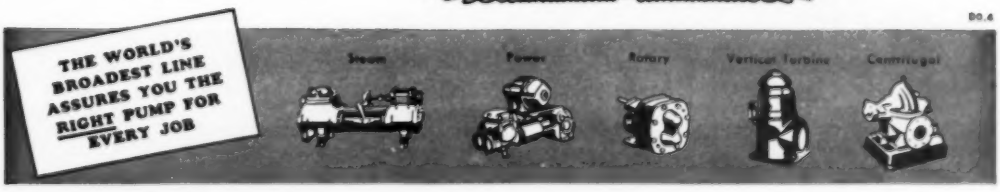
Maximum Head In All Sizes

Available in sizes from 6" to 32", Worthington Type Q Vertical Turbine Pumps handle liquids at temperatures of 7° below zero F to 500°F, with maximum head per stage over the entire size range.

See your local Worthington dealer for the whole story that proves *there's more worth in Worthington*. Complete manufacturing and servicing facilities at Denver, Colo., and Harrison, N. J. *Worthington Pump and Machinery Corporation, Harrison, N. J., Denver 16, Colorado.*

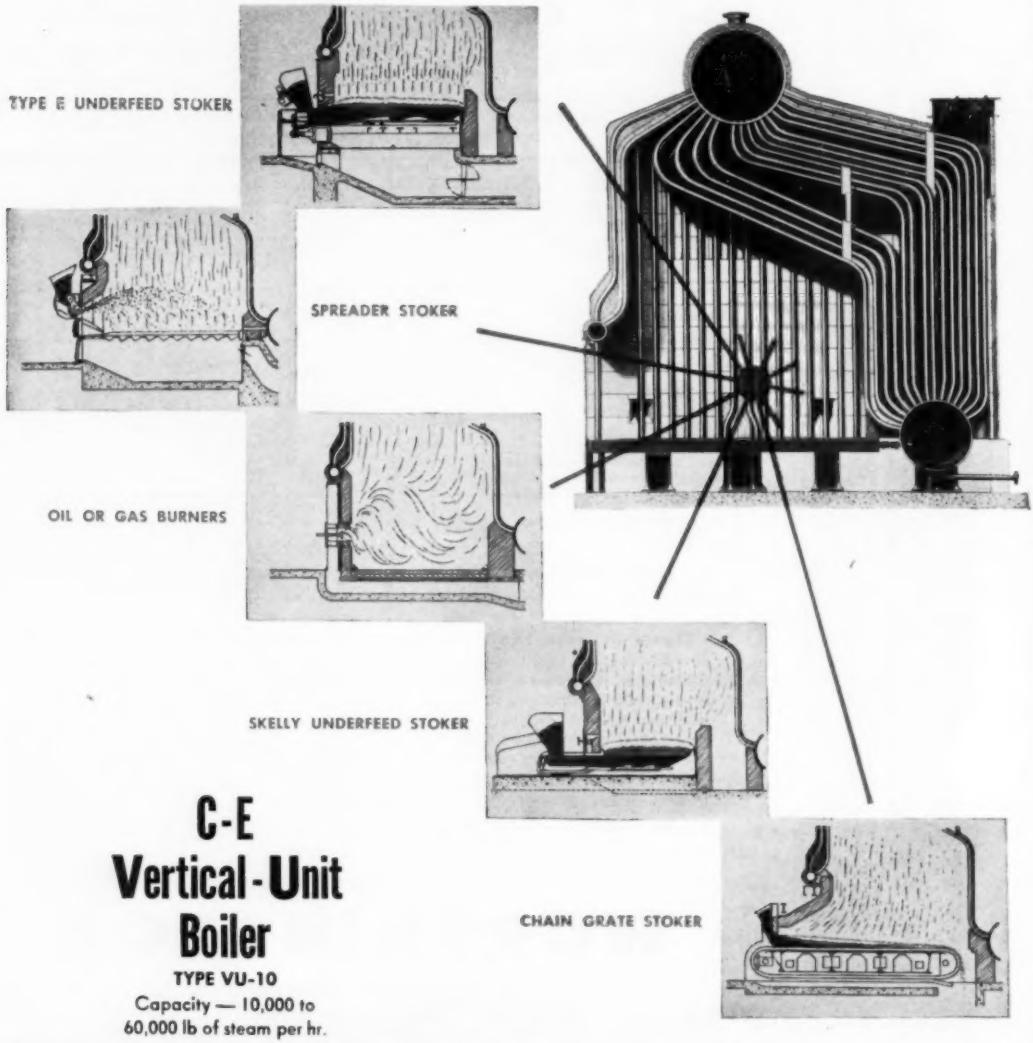
Dealer Franchises Open

WORTHINGTON



For every fuel market and every type of load there is *one best* method of firing. The selection of that *one best* method for the fuel and load conditions of a particular plant calls for judgment based on broad experience and free from any incentive to favor one type of fuel burning equipment over another.

The Type VU-10 Boiler is designed for five fully standardized methods of firing—spreader stoker, single-retort underfeed stoker, chain grate stoker, oil or gas burners. The furnace design is such that any of these methods may be substituted for any other should a change in the fuel market make it advantageous.



C-E Vertical-Unit Boiler

TYPE VU-10

Capacity — 10,000 to 60,000 lb of steam per hr.

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS, ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

Why buy a Boiler Unit piecemeal?

A piecemeal boiler unit is one in which some of the major components are purchased from different manufacturers.

There is no assurance . . . certainly no protecting guarantee . . . that the resulting assembled compromise will meet your performance requirements. If you buy piecemeal, you must accept the uncertainties inherent in divided responsibilities for overall results.

That is why it will pay you to investigate the Vertical-Unit Boiler, Type VU-10. Here is a completely integrated unit . . . boiler, water-cooled furnace, setting and fuel burning equipment . . . available from one manufacturer — Combustion Engineering—Superheater—a recognized leader in both the fields of fuel burning and steam generation. From the initial design stage, the relationship of each of the components, one to the other, has been so developed as to provide the highest possible degree of correlation and standardization. And . . . of prime importance to the buyer . . . the overall performance is underwritten by the C-E sales policy of "one contract, one guarantee, one responsibility."

So—buy *your* next boiler as a *complete* unit . . . the VU-10. Enjoy the peace of mind that comes from the knowledge that you have an installation for which one manufacturer—Combustion Engineering—Superheater — is responsible for fulfillment of performance guarantees. Moreover, you will be able to count upon a reliable source for whatever service or spare parts you may require during the many years that represent the useful life of a modern steam generating unit. B-440

— SUPERHEATER, INC.

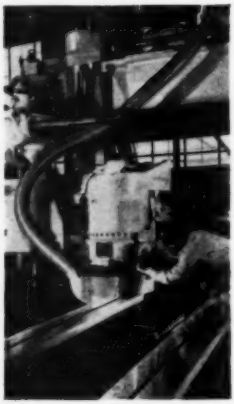
200 MADISON AVENUE, NEW YORK 16, N. Y.

C-E

Answers to tough piping, hose and conduit problems can be simple

Hazardous? And how!

Open wiring in grain elevators is forbidden by code requirements. But rigid conduit from switch to motor in this installation would prevent necessary adjustment of the motor drive. SEALTITE* (American Flexible Metal Hose with an impermeable synthetic covering) offered the ideal solution—combining complete safety with flexibility. Photo courtesy Produce Terminal Corporation, Union Stock Yards, Chicago, Ill.



Gulps Grit

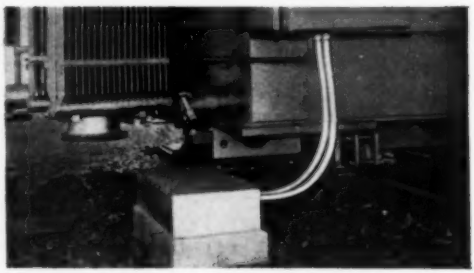
The American Flexible Metal Hose shown on this big grinder has plenty of grit—gulps it regularly. It can take it, too, because it's plenty tough as well as flexible. That's a combination of special value in many a job for which this versatile hose should be considered. Photo courtesy Simmons Machine Tool Corporation, Albany, New York.

Ideal for Innumerable uses

American Flexible Metal Hose and Tubing are made in an extensive variety of styles and metals for conveying liquids, many chemicals, air, steam, vapors, oils, greases, gases and semisolids, under severe conditions of corrosion, temperature, pressure and mechanical stress; for protecting wiring and flexible drive shafts; and for connecting piping or ports that vibrate, move, or are out of alignment. For information on any type of American Flexible Metal Hose and Tubing—or for help in special problems—write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

24951

*Trademark



A Neat "Settlement"

They wanted the feed wires to this transformer in conduit. But they expected a settling action might occur which would put a dangerous strain on rigid conduit. So they used SEALTITE*, combining flexibility with complete protection. A neat settlement of a common problem. Photo courtesy Pacific Gas & Electric Company, San Francisco, Calif.

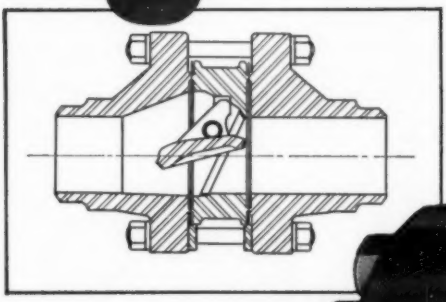
Wherever connectors must move

ANACONDA

American FLEXIBLE METAL HOSE AND TUBING

FOR HIGHER PRESSURES

3 Piece Tilting-Disc Check Valve



Has Removable Center Section for Quick and Easy Replacement of Operating Parts

Here's a Tilting-Disc Check Valve designed specifically for higher pressures. Its construction permits replacement of operating parts, if ever necessary, without removal of entire valve from the line. Once the studs between inlet and outlet sections of the body are taken out, the entire center section (containing disc, seating face and hinge pins) can be removed. Replacement of center section is fast, easy — an important advantage.

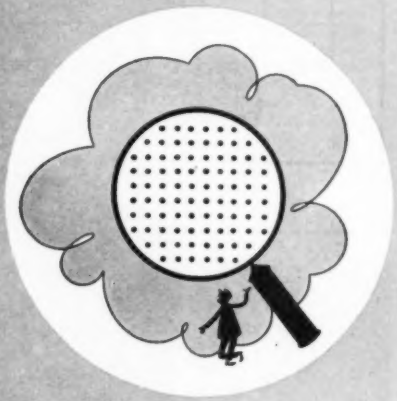
Important, too, is the smooth, easy operation obtained by the tilting-disc design. The balanced disc is held on the open stops by the velocity of the medium being handled. There's no slamming on closure to cause destructive pipe line stresses.

Write for complete description.

The Chapman Valve Mfg. Co.
INDIAN ORCHARD, MASSACHUSETTS

Whatever you need in a Steam Cylinder Oil...

Quick ATOMIZATION



DISTRIBUTION throughout the steam

HIGH TEMPERATURE resistance

ADHESION to cylinder walls and valves

RESISTANCE to washing off lubricated surfaces

Complete SEPARATION from condensate

Sinclair has it!

No matter what your operating conditions—
pressure, temperature, quality of steam; speed, loading;
condensing or non-condensing—
there is a Sinclair Steam Cylinder Oil made expressly
to give the utmost in lubrication satisfaction.

Through proper combinations of steam cylinder stocks and compounding ingredients, Sinclair lubrication technologists have developed a series of steam cylinder oils to fit the operating needs of any installation. There are oils that provide quick atomization . . . persistent adhesion to cylinder walls in the presence of moisture . . . rugged, wear-resisting lubricating films under super-heat . . . or complete separation from condensate where that is the dominating requirement.

A Sinclair lubrication engineer will help you select the proper oil for your particular service.

SINCLAIR
Steam Cylinder Oils

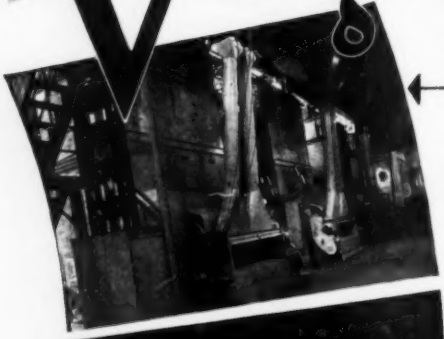
for every steam engine installation

For lubrication counsel see your nearest Supplier of Sinclair Products or write Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.

USE THESE BETTER

Vogt Products

For Today's Tough Service Demands

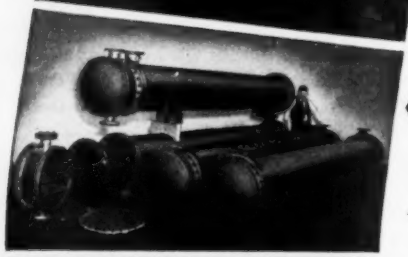


EFFICIENT AND DEPENDABLE STEAM GENERATION

Vogt steam generating units are designed to give maximum rating in a minimum of space with high efficiency and low maintenance expense. Bent tube types and straight tube, forged steel sectional header types to burn solid, liquid or gaseous fuels, as desired, meet every power, heating or process requirement.

PROCESS EQUIPMENT FOR EVERY SERVICE

Stills, towers, oil chilling machines, filter presses, heat exchangers, etc. are constructed to all Codes. They meet all demands for operating security and trouble-free performance and help to lower costs in important process industries around the world.

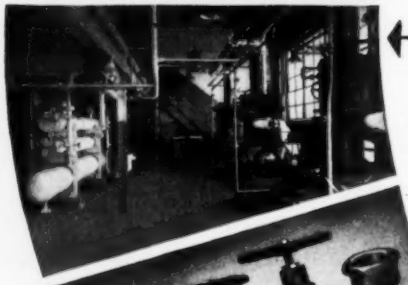


SPECIAL MATERIALS FIGHT CORROSION AND PRODUCT CONTAMINATION

Our modern shops produce a wide variety of equipment made from special metals and alloys to combat corrosion, and product contamination or discoloration. Fabrication procedures employed insure that corrosion resistant properties of welds will match that of the materials from which units are constructed.

MORE TONNAGE AT LESS COST

Over 60 years of manufacturing experience, engineering and research stand behind Vogt refrigerating and ice making machinery. Absorption Systems, Compression Systems, and the Automatic Tube-Ice Machine in a wide range of capacities serve in leading petroleum refineries, chemical plants, ice and cold storage plants, dairies, packing plants, etc., at home and abroad.



DROP FORGED FOR EXTRA TOUGHNESS AND LONG-TIME SERVICE

Vogt valves, fittings and flanges, for top performance in oil, water, air, gas, and ammonia services, at high or low pressures and temperatures, are available drop forged entirely from carbon steel or stainless steel. Valves can be furnished in a combination of materials by using stainless steel for parts affected by service temperature or corrosion, and less expensive alloys or carbon steel for other parts.

Air View of Vogt Plant

HENRY VOGT MACHINE CO.

LOUISVILLE 10, KENTUCKY

BRANCH OFFICES NEW YORK PHILADELPHIA CLEVELAND CHICAGO ST LOUIS DALLAS

Are 10,000 pumps enough for you?

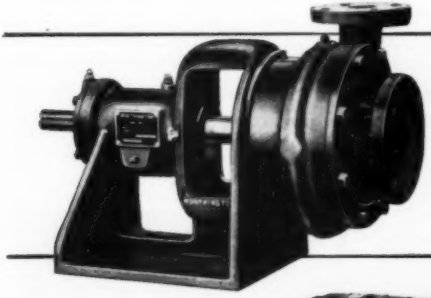
Just about. It takes that many different combinations to make sure that you—big user or small user—get exactly the right pump you need.

That's why we manufacture Worthington centrifugal pumps in over 10,000 standard combinations of capacities, heads, casings and mountings.

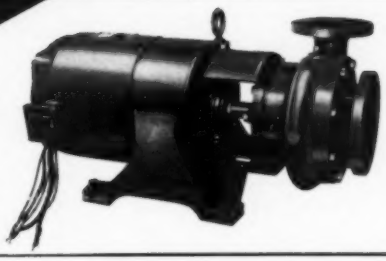
Types CN (frame-mounted) and DN (built-in motor) are made in capacities from 10 to 1800 gpm, heads to 535 ft., with 40 sizes of pump casings and 200 combinations of frame-mounted designs.

And—maximum interchangeability of parts!

Get the habit of asking for a Worthington—you'll get exactly the pump you want.

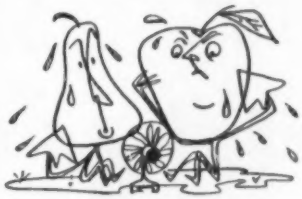


Type CN, frame-mounted, is a real "any-drive" pump—readily driven by electric motor, V-belt, or any other source of mechanical power.



Type DN is the famous Worthington Monobloc design—compact, streamlined, with built-in motor. On both types, liquid ends are interchangeable, and can be equipped with either conventional packing or mechanical seal.

The Fruit Was in a Sweat



. . . and So Was the Pump

They suddenly began having a hot time of it at a fruit and produce company near the Dillon Supply Company in Raleigh, N. C.

A centrifugal pump used in their refrigeration system had called it a day, and the temperature was rising in the rooms where the produce was kept. Without refrigeration, the perishables would have indeed perished.

But a frantic call to Dillon located, in the distributor's stock of Worthington centrifugal pumps, exactly the size needed. Prompt delivery . . . and not a lettuce leaf was allowed to wilt.

It's another example of the wisdom of depending on your Worthington Distributor. No distributor offers *more* pumps . . . no distributor offers more *value* in pumps . . . than a Worthington distributor.

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THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives. PUMPS: centrifugal, power, rotary, steam. AIR COMPRESSORS: water-cooled, air-cooled. PC.0.0

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Send latest bulletin on Worthington Centrifugal Pumps. Any other (type).....

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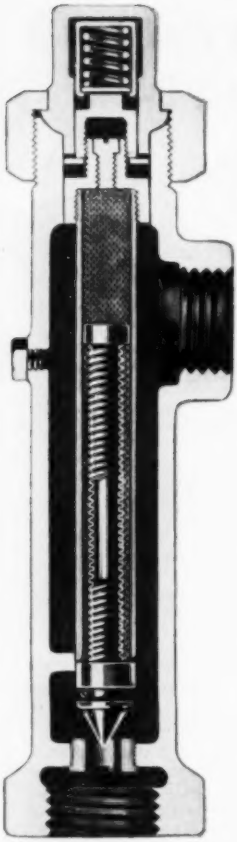
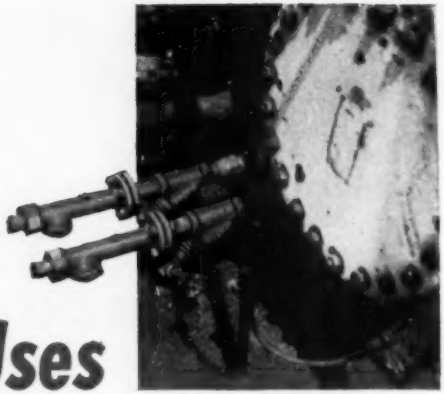
Company.....

Address.....

City.....State.....



The Steam Trap of 100 Uses



On Outdoor Heat Exchangers

When steam heated equipment is too far away to permit returning of condensate to the boiler, Steam Trapping presents special problems.

Special protection is necessary against freeze-ups in winter when equipment is out-of-doors. In every case there is considerable steam waste from re-evaporation when hot condensate is discharged to atmosphere by ordinary traps.

The Sarco Liquid Expansion Steam Trap No. 87 discharges condensate to atmosphere at temperatures never exceeding 212°F. so that there can be no heat loss from flash steam. No protection is required against freezing. A special model is available for fitting on mechanical traps. It can be set to discharge at any desired temperature down to 40°F. minimum. This is known as the Sarco Thermic Drain. Ask for Catalogs No. 250 and 550.

SARCO No. 87 TRAP

FOR

- BULK STATION TANKS
- DOCKS AND PIERS
- INSTRUMENT CABINETS
- OUTDOOR STEAM EQUIPMENT
- PIPE LINE HEATERS
- TANKERS AND TUGS
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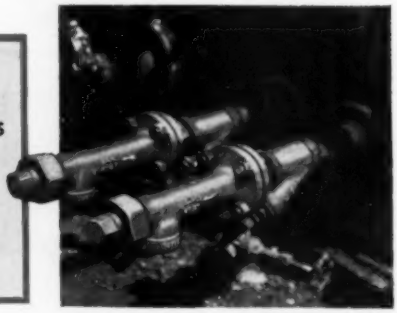

On Oil Storage Tanks

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SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

INDUSTRIAL POWER

February, 1951 Vol. 60, No. 2

RECORD EXPANSION GIVES P G & E SYSTEM HIGHER RATIO OF STEAM TO HYDRO

JAMES B. BLACK, *President*

Early this year Pacific Gas & Electric will put into service the last of nine new powerhouses, which brings to a close the greatest power-building program undertaken by any single utility since the end of World War II. Subsequent additions will follow to meet system needs

CONSTRUCTION programmed for gas- and electric-system expansion in the basic plan is costing $800,000,000. P G & E is adding 1,826,400 horsepower of generating capacity to its electric system, which will provide a total installed capacity in 1951 of 4,094,850 horsepower to serve the 46 of California's 58 counties into which the network extends. This is nearly double the capacity at the end of 1945, and all essential power needs of the area had been met during the war.

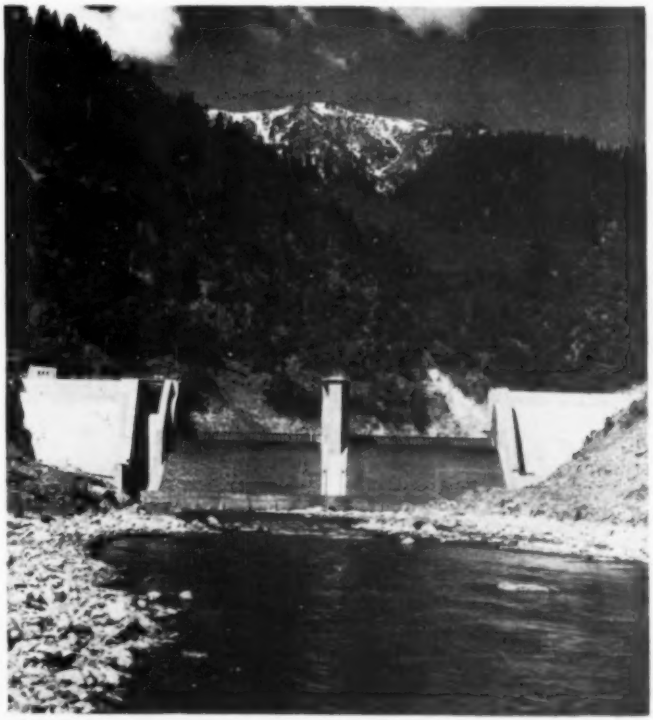
Increased Gas Supply

On the gas side, the program includes laying a 501-mile, 34-inch transmission main to San Francisco Bay from the California-Arizona border at Topock, southeast of Needles. El Paso Natural Gas Company will deliver gas from Texas and New Mexico fields to P G & E at the state border at a rate of 150,000,000 cubic feet per day during 1951 and 400,000,000 cubic feet per day by 1952. The company's "Super Inch", forming part of a 1,600-mile transmission system being built jointly with El Paso, is the largest diameter pipeline ever built for high-pressure transmission of natural gas.

With the expansion of gas transmission and electric generating capacity has gone a tremendous increase in distribution facilities. In the four years from the war's end through 1949 the company built 9,862 miles of electric transmission and distribution line.

Electrical Expansion

This work included such feats as the construction of a 220,000-volt steel tower line along the precipitous walls of Feather River Gorge and the suspension of 23 tons of wire in a nearly mile-long span across an arm of San Francisco Bay. The company has built



Rock Creek Dam on the Feather River is 115 ft high and diverts water through a 6½-mile tunnel to the powerhouse below. Dam uses two 124 by 28-ft drum gates

32 new substations, besides enlarging many others. Exclusive of the "Super Inch" it laid 2,478 miles of gas transmission and distribution line in the four-year period. Service was extended to 195,264 new electric customers and 189,597 new gas customers.

Reasons for Expansion

This expansion program was made necessary by California's rapid growth in population, with an accompanying development of both industry and agriculture, during and after the war. In the 1940-1950 decade the increase in population was 3,582,000, a full 50% —the largest percentage gain for any state in the nation. Even in a state accustomed to unceasing growth since the gold rush and statehood a century ago, a population increase of such magnitude in 10 years is without precedent. Meanwhile wartime restriction on normal building had left power reserves depleted at the end of the war.

A test of the company's success in its tremendous effort to restore its reserves came on July 25, 1950, when P G & E met the greatest peak demand in its history, 3,377,000 horsepower, with 638,000 horsepower to spare, a margin of 19%, and with 670,000 horsepower more still under construction, not counting capacity planned for completion after 1951.

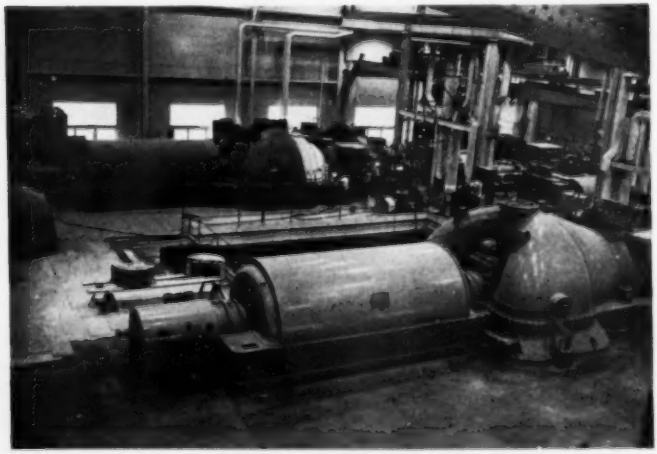
Further Construction

Anticipating a continuation of the rapid growth of power requirements in Northern and Central California, Pacific Gas and Electric already has announced plans for further construction even before its first six-year power building program is complete, and has begun work on this secondary phase.

Station P was enlarged by installing two 149,000-hp generating units, which with the original unit of 62,000 hp gives the station a capacity of 360,000

The newest project is the addition of four new steam-electric generating units of 134,000 horsepower each in 1952 and 1953 at a cost of approximately $56,000,000. Two will be installed at Moss Landing steam plant on the shore of Monterey Bay, where the first of three originally planned units recently was placed in service, and two will be installed at Contra Costa powerhouse on the San Joaquin River near Antioch, which also is still under construction with three units originally planned. Both plants now will have five units and an installed capacity of 670,000 horsepower, making them the largest steam-electric generating plants west of the Mississippi.

In addition to the three steam-operated units, contract already has been let and work is under way on an $11,000,000 hydroelectric development on the Bear River, a tributary of the Mokelumne. Another generating unit of 44,000 horsepower capacity will be installed in the existing Salt Springs powerhouse, served by water to be diverted from Bear River through a 13,600-foot tunnel and a 4,800-foot penstock. The new unit is expected to be in operation in the spring of 1953.

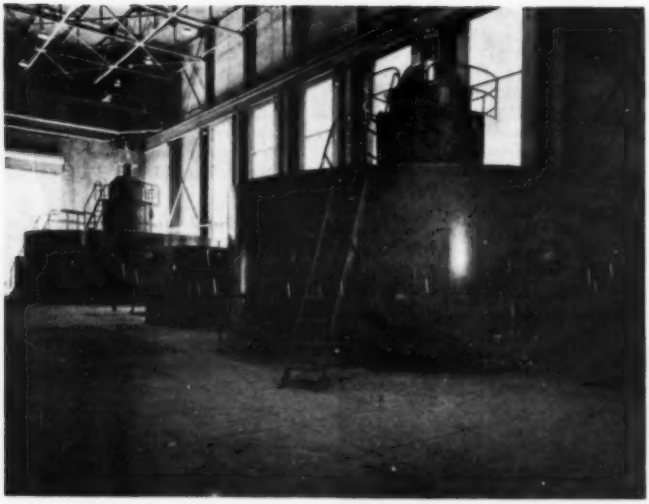


Kern Steam Plant, completed in 1948, was the first major postwar station to be placed in service. Unit added in 1950 brings capacity to 235,000 hp

Development Approval

Another hydroelectric development is a $73,000,000 project on the Kings River, which is awaiting final approval of the Federal Power Commission. The company proposes the enlargement of its existing Balch powerhouse and the construction of three additional plants for the development of 374,000 horsepower of new generating capacity on the Kings.

The Kings and Bear River projects and the four additional steam-operated units to be installed in the Moss Landing and Contra Costa steam plants will give P G & E another 954,000 horsepower of capacity and will bring total postwar plant additions up to 2,780,400 horsepower. Completion of these added installations will give the company a total installed capacity of 5,048,852 horsepower—177% more



Cresta Powerhouse with an installed capacity of 101,000 hp was completed in 1950. Water comes from the Feather River through a 4½-mile diversion tunnel

than it had in the pre-war year 1940. Its investment for expansion since the war then will amount to nearly one billion dollars.

A notable aspect of the postwar construction is the changing ratio of hydro to steam capacity, which it is bringing about. Historically a pioneer in hydroelectric development, Pacific Gas and Electric at the end of the war had an installed capacity ratio of 63% hydro to 37% steam. The new system ratio by the end of 1951 will be 54% steam to 46% hydro, with a total of 2,209,310 horsepower installed capacity in 17 steam-operated plants and 1,885,542 horsepower capacity in 58 hydroelectric plants.

One consideration in the planning that has determined this change is the need of firming hydroelectric power purchased from other producers as well as the system's hydroelectric output. The proportion of purchased power in 1949 was 17% of the total power supply of the P G & E system.

First Major Completion

The first of nine new major generating stations to be completed postwar was the Kern steam plant at Bakersfield, Kern County, at the extreme southern end of the company's 500-mile-long service territory. In a race against time because of a drought then prevailing, even to the extent of shipping some 20 tons of critical equipment by air, the first of two units was placed in service in May, 1948. A second unit bringing the plant's capacity to 235,000 horsepower was placed in service in the month of January 1950.

To meet an emergency situation in a somewhat isolated lumbering and agricultural region in the extreme north of the territory, centering at Eureka, an interesting expedient had previously been resorted to late in 1946. The stern half of a former Russian tanker, the Donbass III, which had broken in half in the north Pacific, was purchased and after being towed from Seattle, was beached at Eureka to serve as a generating plant. Its turbo-generator has a capacity of 6,602 horsepower and has proved an economical source of electrical energy.

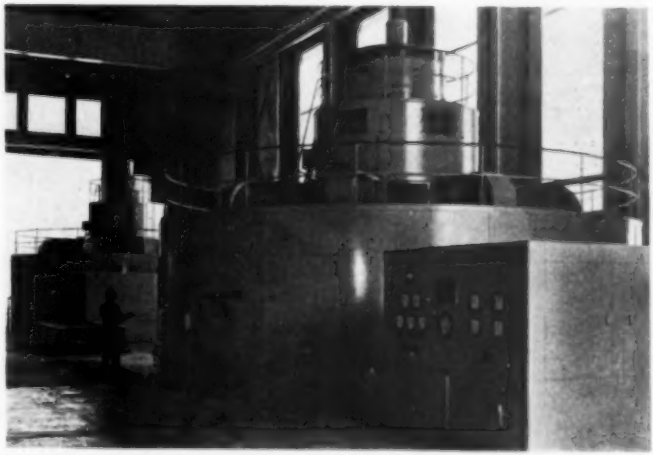
Electra powerhouse, a hydroelectric plant on the Mokelumne River in Amador County, came into service in June, 1948, adding 133,000 horsepower of capacity from three double overhung single-nozzle impulse waterwheel generating units. Upstream a second new plant in the Mokelumne Project, West Point powerhouse, was placed in operation the following November. The latter plant has one 21,000-horsepower vertical shaft Francis turbine. A 14,146-foot tunnel, 12 feet 10 inches by 15 feet 6 inches in section, was driven to carry the river flow from the after-bay of existing Tiger Creek powerhouse to West Point powerhouse.

Tunnel and Penstock

Another tunnel similar in cross section and 42,850-feet long was driven from the tailrace of West Point powerhouse to Lake Tabeaud, forebay of Electra powerhouse. A 12-foot horseshoe tunnel 3,000 feet long and a 3,350-foot penstock carry the water from the forebay to Electra powerhouse under a head of 1,250 feet. P G & E now utilizes the water of the Mokelumne in the operation of four hydroelectric plants.

The next additions to the system were two new units, each of 149,000 horsepower, placed in service at Station "P" steam plant in San Francisco in December, 1948, and January, 1949. Colgate powerhouse on the Yuba River was completed in June, 1949, with 40,000 horsepower capacity from a vertical shaft Francis turbine.

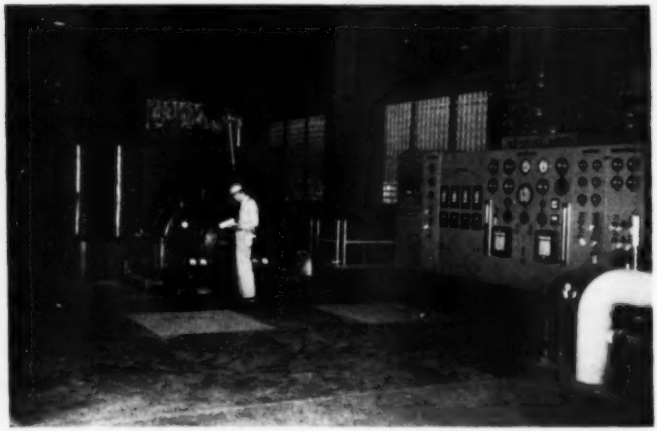
Another efficient river development like that on the Mokelumne was com-



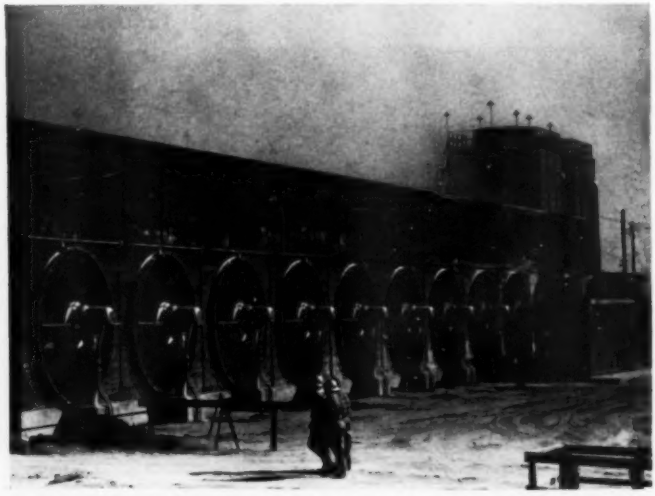
Rock Creek Powerhouse has two vertical Francis turbines with total capacity of 169,000 hp. Switching structure stands on concrete platform above highway

pleted between November, 1949, and March, 1950, on the Feather River, where the 101,000 horsepower Cresta powerhouse and the 169,000 horsepower Rock Creek powerhouse were built simultaneously. This makes five powerhouses on the Feather River with a total capacity of 512,960 horsepower. Each of the newly completed plants has two vertical shaft Francis turbines. The entire development extends along 16 miles of the river and includes two gravity type concrete diversion dams and two horseshoe tunnels 25 to 27 feet in section totaling 55,361 feet in length.

The dams are low weir-type structures, 115 and 113 feet high, each with two 124 by 28-foot drum gates for primary water-level control. The 34,680-foot Rock Creek tunnel, with a grade of 0.3 %, was designed to carry a peak flow of 3,000 second feet and an average of 1,560 second feet. The effective head at Rock Creek powerhouse is 481 feet. Below Rock Creek powerhouse the water is diverted through the 20,681-ft Cresta Tunnel at a 0.30% grade.



Moss Landing has one 134,000-hp unit in operation with two more to be completed in 1951 and another pair in 1952. It will then have a capacity of 670,000



Kern Steam Plant cooling towers. This is one of two fourteen-cell forced-draft towers for unit No. 1. Each is capable of dissipating 259,000,000 Btu per hour

Effective head at Cresta powerhouse is 254 feet. The Cresta surge chamber is a differential type with its top above ground. A 19-foot lateral tunnel 154 feet long connects the bottom of the chamber to the 26-foot main tunnel. Because of geological conditions the Rock Creek differential surge chamber is subterranean, located directly above the tunnel.

Plants Feed Main System

Moss Landing and Contra Costa steam plants are the eighth and ninth postwar plants, respectively. The choice of sites for these two plants and Kern steam plant was influenced by the fact that on the P G & E system it is not feasible to take away the full output of a large plant entirely over distribution voltage circuits, nor can the large blocks of generated power be absorbed locally at periods of light load. The new plants therefore were designed for system as well as local area use, and it was necessary in each case to provide full capacity outlets directly to the transmission system.

Plant Location Factors

With such outlets the general plant locations were determined after considering such factors as availability of fuel, make-up water and condenser circulating water, foundation conditions, area power supply and load, and the possibility of future expansion. In the case of Kern steam plant, since there is no river in the area capable of supplying condenser circulating water, cooling towers are used and the make-up water is supplied by wells.

In general, the three new steam stations and the expanded Station "P" are of semi-outdoor design, with the turbine room and control bay entirely housed. At Kern, where delivery was a prime consideration, the two units are 1,800-rpm machines. The eight main turbine generators of the other three plants are 3,600-rpm machines designed for 1,300 psi and 950 F. The steam generators for Station "P" and Kern were designed for oil and gas fuels. Conversion to coal, should this become desirable, can be accomplished with some loss in capacity.

Full Capacity on Coal

At Moss Landing and Contra Costa, on the other hand, provision is being made for possible use of coal with full capacity output. Fuel requirements for the new steam plants will be met in part with Texas and New Mexico gas introduced through the "Super Inch" main. At Moss Landing, which has no natural harbor suitable for large ships, a fuel pipeline was laid on the ocean floor to a point 3,500 feet off shore, where tankers moor to anchored buoys.

FILTERS.....WHAT THEY ARE, HOW AND WHY THEY ARE APPLIED

Here is a complete treatise on filters for removing contaminants from such fluids as air, water, lube and fuel oil and processing liquids. Numerous types and the theories behind them are explained, along with suggested applications for the removal of certain foreign materials

D. H. VANVLECK, *Manager Sales Engineering Div., The Cuno Engineering Corp.*

A FILTER is a mechanical device that separates solids from liquids. Under some specific circumstances a filter may separate two fluids from each other, but only under the most carefully controlled conditions, and then only when the fluids are not miscible.

Sometimes filters do not meet expectations because so-called solids are only solids by comparison. For instance, some gummy materials—breakdown products in lubricating oils—are actually fluids. A filter may not remove these to the extent anticipated and may be blamed for poor performance, whereas it has been asked to do something outside its function. Filters may be grouped according to the filtering media depth and space types.

Depth Types. These offer a relatively long and tortuous path for the passage of fluids and stop solids by entangling them within the filter media mass. This class may be subdivided into groups according to how the entangling structure is obtained as fiber mass, treated or untreated, ceramic block or precoat.

Fiber mass types cover filters whose element or cartridge consists of a more or less loosely packed accumulation of fibrous materials, such as felts, woven textiles, blotting paper and cellulose.

Ceramic types have a porous structure. Porous metals may be grouped here, for while not ceramics, they are functionally the same and have the same merits and defects as a filter.

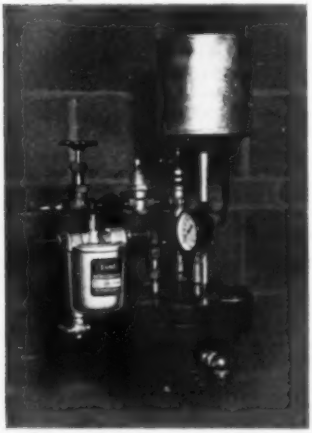
Precoat types build up a temporary filtering bed on some supporting structure (wire cloth, canvas duck and paper). The bed is destroyed and rebuilt as part of the cleaning cycle. In this unit a filter aid, such as clay, diatomaceous earth or some special proprietary material is mixed, in appropriate proportions, with the fluid to be filtered. When passed through the filter a cake or bed is formed consisting of the filter aid and material to be removed. The filter aid keeps the cake open enough to permit liquid to pass but dense enough to stop solids or filterable material.

Filtering is done by the bed of filter aid and previously collected residue. This bed must be established by circulating some of the charge to establish the cake. The first or precoat run will not have its solids effectively removed.

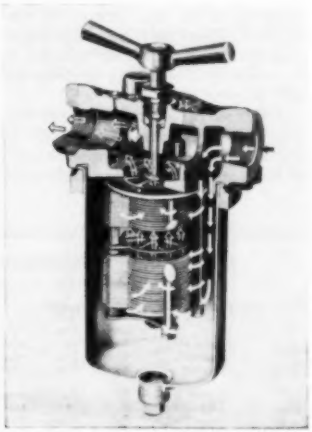
To clean, the cake is removed by back flowing or by disassembling the filter and manually stripping. Precoat filters usually involve considerable auxiliary equipment such as mixing tanks for adding the filter aid, circulating pumps and changeover valves to divert the precoating flow. Automatic or continuous operation is difficult, and labor charges are high.

Space Types. Media in these filters offer a relatively straight path for fluid passage and stops solids that are too large to pass the openings. This type may be subdivided into screen, bag or pot (cleaned by removal from service) and scraper, comb and backwashing.

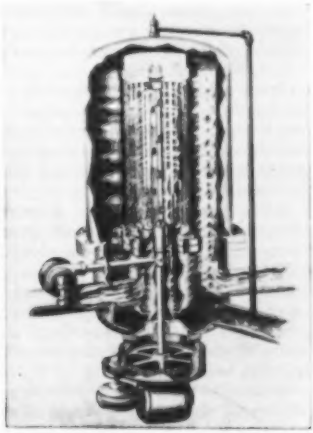
Screens, bag or pot types include simplex and duplex units, from small thimble strainers to large trash pots.



Compressed air, at 5 cfm, has dirt, oil and water removed in this type filter



Manually operated scraper type filter traps large particles between its discs



Normal flow is into cylinder. Backwash pump reverses this action removing dirt

The common characteristic being they must be removed from service for cleaning. This is probably the most frequently used,the cheapest and at the same time most inefficient filter device.

Scraper types are composed of a grid of parallel bars, usually flat. They are distinguished from screens only because they are easier to clean, by raking or scraping. Another example is the wire wound type. The element is cylindrical, and cleaning is effected by scraping the upstream surface.

Comb-type filter media are much the same as the ribbon or slat type, but cleaning is more positive in that the space between bars is combed out rather than scraping the surface.

Another modification is the backwashing type, structurally the same as the cylindrical ribbon types or disc types, but distinguishable by being cleaned by reverse flow. Other media may be used, such as perforacted porcelain discs, corrugated metal strips and simple wire winding.

Before determining the best way to remove undesirable solids, their physical nature must be known as it affects filterability. Unwanted solids can be divided into abrasives, gums or goo and fiber.

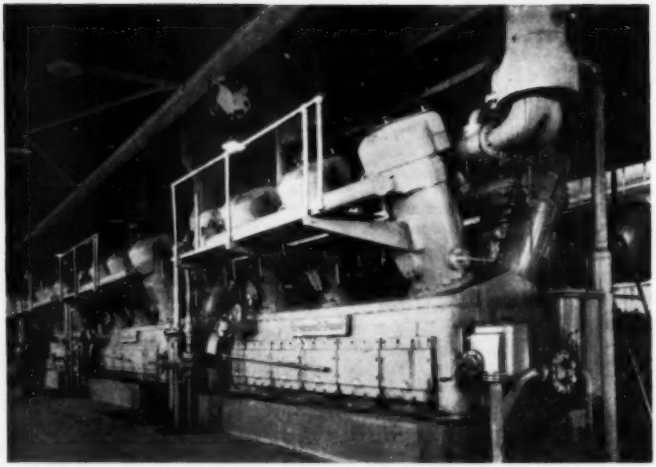
Abrasives can best be handled with filters having no moving parts, but if such are used, they should be located downstream. The usual case where abrasives alone are met is in grinder coolant and cutting oils. These jobs are seldom complicated by any significant quantity of gums and lint.

Most depth filters do an excellent job in removing abrasives. The reason they are not more widely used is the dirt-holding capacity is limited. In the case of replacement-element types the cost of elements is high in terms of gallons filtered. In precoat types, the operating charges are high because of the necessity of frequently rebuilding the filter bed.

Space types, in general, are not as thorough in removing abrasives as depth types. Nevertheless they seem to be more widely used, because of favorable balance between cost and performance of operation.

Space types of the screen or noncleaning variety usually do not work out so well. If the screen is fine enough to do any good, it blinds up too easily, leading to high replacement and maintenance charges. Cloth bag elements give better results, at least from an economic standpoint, since the element is apt to be cheaper.

Scraper and comb types are not so well suited for removing abrasives, as abrasives cause excessive mechanism wear. Acceptable quality of products is frequently obtainable, but maintenance costs are apt to cause an economic loss.



These 600-hp gas compressors are equipped with an oil filter and cooler combination that is an integral part of the machine. Oil enters at 180F leaves at 150F

Fluid backwash types seem to offer the best answer to handling abrasives alone. High initial cost is a deterrent, but low maintenance and operating charges frequently overcome the first cost factor. In larger sizes they become cheaper in terms of dollars per gpm, so they are more frequently found in large plants and central-system cleaning jobs.

Some depth types are not satisfactory for gums and goos as they "plaster" or seal off the fine tortuous passages with an impervious layer of slime. This can restrict and even completely stop flow. The short life and tendency to plaster is sometimes overbalanced by the high degree of solid removal. Using such filters in by-pass hookups is an economic solution to the problem of obtaining efficiency and still keeping costs down.

The fiber mass group of depth-type units probably finds its best field in gum and goo removal. The wide range of fibers available makes possible many variations in filter structure and media. A great many special-purpose designs have been evolved. Some have quite limited applications, but doing an excellent job in a special field, and others have considerable range of effective use. Most effective of this group are those that offer in some degree graded density in depth. That is, a more porous or open structure near the surface first presented to the fluid, shading off to a tighter or more dense structure at the discharge face. The greater degree to which graded density in depth is offered, the greater the resistance to plastering.

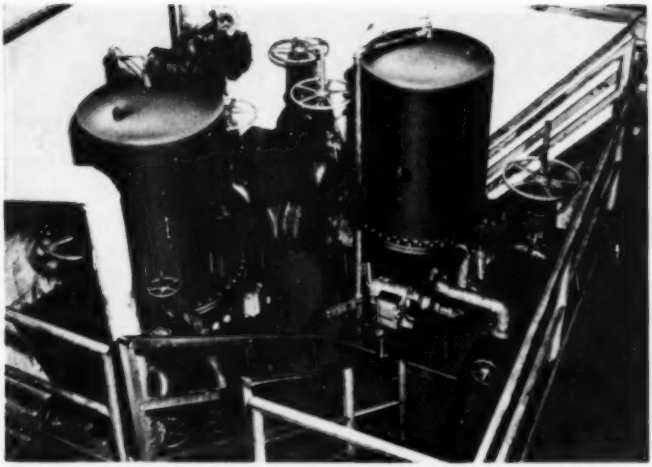
Ceramic filters also are reasonably good at handling gums and goos, but because of the difficulty of controlling porosity, they offer little in the way of graded density within the media. This causes excessive plastering, and unless their use is justified by some chemical or absorptive action they do not find much application where the principal contaminants are gum and goo.

Precoat filters can do an outstanding job. In fact precoating and filter

FILTER CLASSIFICATION AND PERFORMANCE

Filter Group		Type of Contaminant: Abrasive			Gum & Goo			Fibrous		
		Removal	Life	Cost*	Removal	Life	Cost*	Removal	Life	Cost*
Depth Types	Fibre Mass	Good	Fair	Med	Good	Good	Med	Excell	Med	Med
	Ceramic	Good	Low	High	Good	Poor	High	Excell	Med	Med
	Precoat	Excell	Low	High	Excell	Med	High	Excell	High	High
Space Types	Screen & Bag	Fair	Poor	Med	Poor	Poor	Med	Good	Short	High
	Edge-Scraper	Fair	Poor	Med	Fair	Poor	Med	Good	Short	High
	Edge-Comb	Fair	Poor	High	Fair	Good	Low	Good	Short	Med
	Backwash	Good	Excell	Low	Poor	Poor	High	Good	Short	Low

*Cost refers to operating cost not installation. Includes replacement of cartridges or precoat labor or maintenance of all metal types.



River water, for heat exchangers in a large steel mill, is filtered and cleaned in these units, at the rate of 7,000 gpm, under a working pressure of 125 psi

aids were really developed to make the complete removal of gums and goos possible from an economic standpoint. The precoat material or filter aid, when properly applied, prevents plastering by maintaining a porous media up to the machine capacity limits.

Removal of tarry residue in phenol recovery operations at coke ovens or wax in manufacturing lube oils are a couple of examples of filter problems that can only be handled with the precoat and filter-aid technique. Unfortunately operating costs are high, hence this type of filtration is the last resort, and only when other and cheaper methods have proven inadequate.

For gums and goos the space type filter offers some advantages but has some inherent disadvantages. In general, they must clean readily or they will plaster. They must be operated at low ratings to be effective.

Screens and bags, being non-cleanable while in operation, do not offer much advantage. If operated at low rates they plaster quickly and blind off. If operated at high ratings, the amorphous nature of the solids permits shape deformation allowing them to squeeze through.

Scraper types do somewhat better, as plastering on the outer face can be prevented by scraper action. But, the particles that gained partial passage will have their outer larger part cut off by the scraper. The remainder then passes through or remains as a plug at that point.

Knife combing of the actual slots insures restoration of full initial capacity each time the element is combed. Cut-offs are combed out instead of being pushed through. Velocities must be held down or amorphous materials will be distorted so they pass through.

Backwashing types do not work out so well on gums and goos. Cleaning is not positive in a mechanical sense, because a concentrated force cannot be brought to a point of resistance.

To apply a filter properly, the contamination to be removed has to be evaluated by (1) its nature, that is the relative proportion of abrasives, fiber and goo and (2) the effect of these on the system or mechanism to be protected. Filters are available that are better suited to the removal of a particular type of contamination than others.

Consider the life cycle of an internal combustion engine. When new, and on its break-in run, contamination found in the lube oil is quite different than that met later on. The new engine, assuming it was supplied with fresh oil, is contaminated with lint, core sand, paint, metal chips and general shop dirt. This is true in spite of the best efforts at housekeeping by engine manufacturers.

During the war, at one plant where tank engines were made, parts were carefully washed, and cleanliness was a watchword. Yet filters were destroyed on the green run. It reached a point where the practice of aircraft engine manufacturers was adopted: A number of filters were segregated and painted red. These were installed on a new engine and kept there until completion of the green and manufacturer's test runs, a total of about 5½ operating hours, over the entire load range. A new filter, the one shipped with the engine, was installed for the final run.

Another illustration pointing up to the idea that to protect the same type of equipment, a different type of filter should be used is frequently met in water service. If the major portion of the contamination was sand and mud —primarily abrasive—the backwashing type would be suggested. If, on the other hand, the water source was backwater, loaded with paper mill waste—principally fiber, relatively little or no abrasive—the disc type is offered.

Evaluation of a filter comes in determining how far toward ideal filtering it is economical to go. In general it does not pay to go any further than the removal of any particle that could become lodged in the smallest passage. This includes running clearance between moving parts.

As a rule, a maximum clear opening through the filter media one-half the size of the smallest machine clearance approaches the economic balance between cost and degree. For example, there is little economic justification for filtering oil to a few microns for a large sleeve bearing having a clearance of 0.008 in. or 0.10 in. The few particles of the maximum size that would pass 0.004 or 0.005 in. should pass the bearing with the minimum of damage.

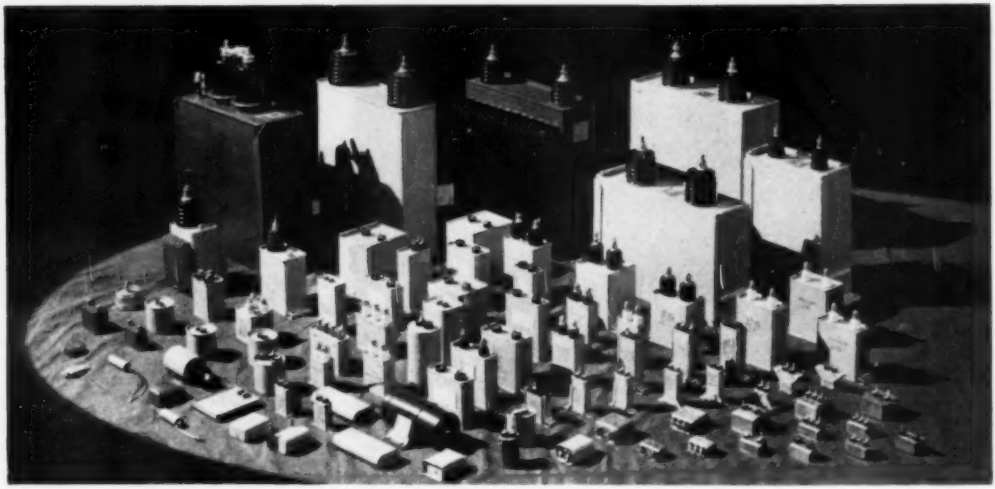
In a steam or air atomizing burner the smallest nozzzle opening may be 0.030 in. yet extremely fine filtration is often specified. A considerable portion of the contaminant in heavier grades of fuel oil is carbon or carbonaceous matter, which has a high Btu content. Taking this out is costly.

BY-PASS VERSUS FULL-FLOW FILTRATION

Pounds of Sludge in System at Stabilization

Filter efficiency, %	Flow, %				
	10	20	33	50	100
10	10.00	5.00	3.33	2.00	1.00
20	5.00	2.50	1.67	1.00	0.500
40	2.50	1.25	0.833	0.500	0.250
60	1.67	0.833	0.555	0.333	0.167
80	1.25	0.625	0.416	0.250	0.125
100	1.00	0.500	0.333	0.200	0.100

Basis:—100 lb oil in system
0.1 lb sludge added per cycle



Many types and sizes of capacitors fill a variety of applications in modern industry. Quiet operation and simplicity give no hint of the importance of their job and the investment involved. They fully deserve the spotlight of your attention

CAPACITOR CARE THAT SAVES MONEY

Check this list of practices that can drain dollars from your capacitor budget when they creep into plant procedures. The simple remedies given will pay off with maximum capacitor service and stable circuit operation

STANLEY E. HOOD, *Transformer and Allied Products Div. General Electric Company*

MODERN CAPACITORS in the smaller sizes are so simple and reliable that their durability under excessive abuse is sometimes taken for granted by the men who normally handle them. Although they do not have to be pampered, there are certain limits in the procedures of electrical testing and mechanical handling that cannot be exceeded without causing or contributing to failure. Frequently, the capacitor itself is blamed when it fails or when circuits do not function properly, although the real cause could be traced to improper treatment or application.

With their excellent service record, small capacitors will pay large dividends from proper handling, test and application. Practices which should be altered or avoided if satisfactory service is to be expected can be classified under electrical and mechanical misuse.

Major abuses which are of an electrical nature apd contribute to capacitor failure or faulty operation will be discussed first.

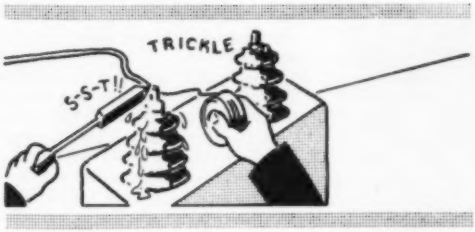
Testing at Excessive Voltage accounts for many capacitor failures. Approximate d-c test voltages which may be applied to a-c and d-c units are given in Table I.

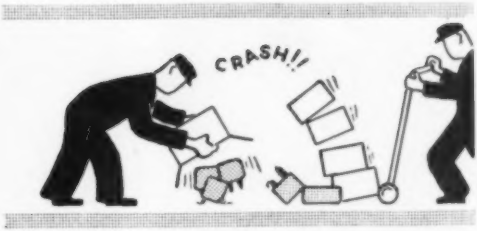
Where the capacitor has only one line terminal and the other connection is made to the case, only terminal to terminal values given in the table should be used.

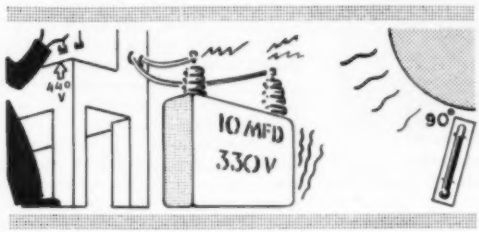
A fair indication of whether a capacitor is good or bad is obtained by the use of a 250- or 350-v d-c power supply, a neon lamp and test prods. Power supply voltage is applied to the capacitor with the prods, the neon lamp being connected in series. On first contact the lamp will flare up and then gradually die out if the capacitor is good. If bad, the lamp will continue to glow at a brilliancy dependent upon the amount of capacitor leakage. A short-circuited capacitor will cause the lamp to glow at full brilliancy.

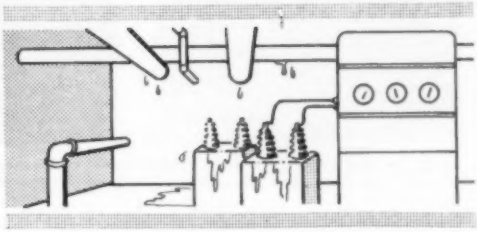
After electrical testing operations, make sure the capacitor is completely discharged to avoid danger of shock to anyone handling it by shunting a 10 ohm resistor across the terminals. Under no condition should the capacitor be short-circuited directly, as with a screw driver, because serious internal damage may result.

Improper Fungicides on capacitor bushings is a mistake which developed during World War II. At the start of the war, very little was known about the characteristics of fungicides. Certain of their ingredients caused low insulation resistance and low corona-starting voltage with correspondingly









Poor soldering, above, and high voltage and temperature, below, should be replaced by proper electrical techniques

Careless handling, above, and corrosive atmospheres, below, cause mechanical defects contributing to electrical failure

low arc-over. Laboratory research finally evolved compounds suitable for the purpose.

High Discharge Currents, caused by installation of standard capacitors in electrical circuits involving abnormally low discharge impedances, result in more electrical failures than any other abuse. To withstand this service, capacitors are designed to carry high current. They are provided with extra dielectric to prevent breakdown under high voltage stress and with increased size to dissipate heat as well as to accommodate extra insulation.

Careless Installation of capacitors is usually associated with ground faults external to the capacitor itself. Such failures are often caused by excess solder overflowing between bushing terminal and case or from insufficient insulation on the leads. Always make sure that a neat soldering job is done on or about the terminals, and that lead connections are properly insulated.

Incorrect Installation covers those cases where a group of capacitors, with unequal capacity rating, is connected in a series across a source of a-c or d-c voltage. This causes the voltage to be unequally distributed because the unit with the least capacity or greatest insulation resistance receives the greatest voltage across the dielectric, with possible consequent failure. After one failure, full circuit voltage is automatically applied to the remaining units in series and each in turn is subjected to excessive voltage and failure. Even if units of equal capacity are connected in series, ground failures are possible unless the capacitor or installation design includes sufficient case insulation to withstand full circuit voltage.

Corrosive Fluxes on bushing terminals will cause such difficulties as corona, corrosion and arc-over. Apparently a little known fact, corrosive fluxes in contact with commonly used plastic or ceramic insulators destroy their insulating value. When soldering leads to capacitors, use either rosin core solder or a solution of rosin and alcohol to prevent such harmful effects.

Excessive Voltage or Temperature in the operation of capacitors is an abuse which should always be avoided. It is a simple matter to connect a 330-v capacitor to a 440-v line and assume it will "take it". Possibly it might, but overheating and ultimate breakdown may result. Installation of capacitors in poorly ventilated places or close to apparatus which operates at high temperature also may cause overheating and eventual failure. Best policy is never to apply more than rated voltage to the capacitor or install it where the ambient temperature will exceed 75 C.

High Humidity and Altitude may cause bushing arc-over on standard capacitors. This service requires a specially designed capacitor which has the necessary insulation strength added to assure reliable operation under such conditions.

Attempted Repairs in the field are not recommended. Even a seam leak resulting from damage to the container might be made worse and cause electrical failure. Major repairs which would involve cover removal are naturally out of the question. The capacitor roll would be exposed to atmospheric moisture or contamination and its life seriously affected.

Mechanical Troubles

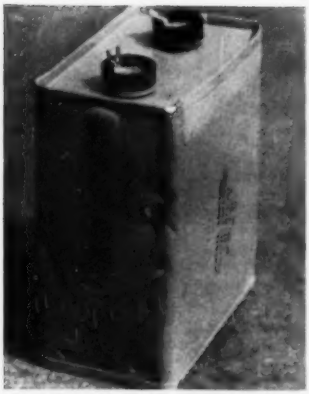
The following principal abuses often contribute to mechanical troubles.

Careless Handling of capacitors accounts for such troubles as dented cases, bent or leaky bushings, bent brackets, broken insulators, seam leaks, damaged labels or stamping and scratched paint. Make sure capacitors are not dumped from cartons to storage bins, knocked about on assembly lines or otherwise carelessly handled.

Excessive Tightening of terminal nuts is likely to cause stripped threads, broken terminals, cracked insulators,

TABLE 1—RECOMMENDED CAPACITOR D-C TEST VOLTAGES

Capacitor type	Test points	Test voltage	Application time
D-c	terminal to terminal	2 x rated d-c volts	15 sec
D-c	terminal to case	2 x rated d-c v plus 1000	1 sec
A-c	terminal to terminal	4 x rated a-c volts	15 sec
A-c	terminal to case	6 x rated a-c volts	1 sec



To the inexpert, these apparently minor results of mechanical abuse give no hint of seam leaks and damaged insulation that will become the engineer's headaches

broken gasket seals and bushing leaks. A great deal of caution should therefore be used when tightening terminal nuts after attaching lead wires, terminal lugs or bus bars.

Flexing Bushing Terminals should be avoided as much as possible since they easily break, especially after they have been previously heated. When a terminal does break, the capacitor is practically ruined because of difficulty in making connections to it and the impracticability of repairs.

Soldering to Cases may be necessary in attaching ground wires or special brackets. Avoid opening any of the side, cover or bottom seams. Satisfactory repairs are difficult. Recommended procedure is to send the unit back to the manufacturer where proper repairs and tests can be made.

Careless Assembly of capacitors on a chassis with associated equipment often results in punctured cases or leaky seams. See that machine screws used for mounting associated apparatus do not project to a point where they come in contact with the capacitor case and puncture it. Care should also be taken to see that too much stress is not applied to case seams when mounting capacitors on the chassis, thus causing them to leak.

Bending Bushing Assemblies to line up with bus bars is not recommended because the gasket seal between bushing and cover may be broken and cause compound leakage. There is also danger of causing an open circuit by breaking the top connection to the stud.

Coating Name Plate Stamping with lacquers is usually unnecessary to protect it from damage since, in most cases, lacquer-base stamping inks are used. Actually, there is possibility of harm resulting from use of some lacquers because they act as a solvent for the stamping ink and cause it to run and blur.

Storage or Installation of capacitors in places where excessive dampness or corrosive fumes exist should be avoided. Cases are liable to rust with accompanying leakage of liquid dielectric and subsequent possibility of failure. Moisture and fumes may cause harmful condensation on the surfaces of bushings, resulting in arc-over or failure.

Severe Vibration may cause case seams and gasket seals to be opened, or brackets and electrical connections to be Broken or loosened. Capacitors with properly designed mounting features will provide the answer where such conditions exist.

In addition to avoiding the electrical and mechanical abuses outlined, it is also wise to enlist the services of a reliable capacitor engineer for assistance on problems concerning capacitor applications. See that he is provided with at least the following basic information:

1. Type of service such as filter, arc suppression, power factor correction, interference elimination, motor starting and discharge characteristics.

2. Complete electrical rating and requirements such as microfarad capacity and tolerance, maximum operating voltage, frequency, a-c ripple, ambient temperature range, insulation resistance, duty cycle, life expectancy and government or commercial specifications.

3. Complete mechanical details such as dimensional limitations, type of mounting desired, and type of terminals.

4. Any other details pertinent to the application.

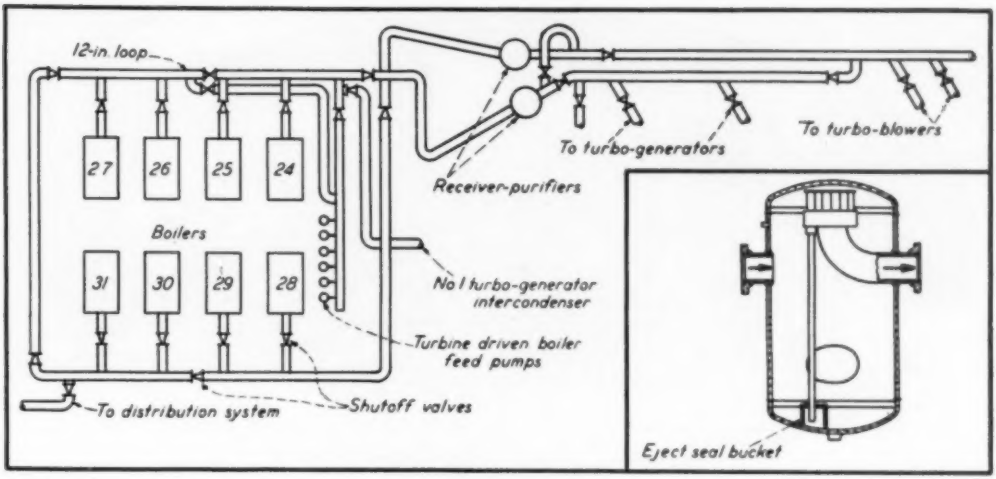
An honest effort to comply with these suggested recommendations will provide many dividends in actual dollars, time, service and life.

TV Brings Color to Industrial Control

Color television is now invading the industrial field and promises to be of value where colors of the subject are important in the image viewed. Allen B. Du Mont Laboratories, Inc. announced delivery of the first production unit of a non-broadcast (industrial) high-fidelity system, a development of which was shown at a recent convention in New York. Engineers evolved the system to its present commercial form and the equipment is being offered to industry for applications in the non-broadcast field.

As with monochromatic television, there are many and varied uses for this equipment, which is sold as a ready-to-operate package. Industrially, it may also be used for the remote viewing of phenomena dangerous to personnel, or where, for practical purposes, eye-viewing is not feasible. Scenes reproduced in full-color are essential in many applications, and are more effective in others.

The industrial color system employs a closed-circuit or wired system free from restrictions imposed on broadcast color systems. Without limitations, it is possible to build a wide-band system with excellent reproduction of color and with greater picture resolution, sharpness and clarity than black-and-white home-type receivers. 525-line picture scanning, with a synchronous field rate of 10, greatly simplifies the equipment and makes the compact portable combination of color camera, camera control, color mixer and accessories possible. A small distribution amplifier connected by cables to a number of color monitors or special receivers will enable large numbers of viewers to witness the reproduction of scenes picked up by the camera. All equipment is designed for industrial and commercial uses requiring simplified operation and compact apparatus.



Receiver-purifiers in each end of the pipe loop connecting the boilers catch the water slugs which otherwise would be driven into the turbines at dangerously high velocities. Inset, right, shows a cross-section of the 9-ft high purifiers

J & L TAKES THE SLUGS OUT OF STEAM

BRUCE R. WRIGHT, Vice President, The Centrifix Corporation

POWER NEEDS at the Otis Works of the Jones & Laughlin Steel Corp. require eight boilers in the blast-furnace powerhouse. These drive two turbo-blowers, one rated 60,000 cfm at 30 psi and 6,800 hp, while the other is rated 45,000 cfm at 23 psi and 4,450 hp. Steam from the boilers is also used to drive two 10,000 kw turbo-generators for electrical power.

The eight boilers are connected to a 12-in. header loop with four units on each side. Four boilers on one side are rated at 834 hp each. Two boilers on the opposite side are rated at 822 hp each, while the remaining two are each rated at 100,000 lb per hr at 235 psi.

Combined output of the eight boilers furnishes 100,000 lb per hr of superheated steam to the 12-in. mains at each end of the loop. Steam flow of 200,000 lb per hr may be taken off either end as needed.

As uninterrupted power delivery is essential to steel making, protecting the turbines against any eventuality that might result in damage and unscheduled shut-downs is necessary. Six shutoff valves are spaced around the loop, located between pairs of boilers. Thus, the boilers in any section of the loop can be cut out in case of emergency without halting steam delivery. As a further safeguard, each boiler is equipped with an automatic water-level regulator to maintain predetermined levels and to prevent carryover from reaching and damaging turbine blades.

As complete insurance against turbine damage, two 12-in. receiver purifiers with 36 in. diameters are installed between header and main at both ends of the loop. As seen in the layout drawing above, the receivers are located before a crossover line that may be used to shunt the flow from one main into the second.

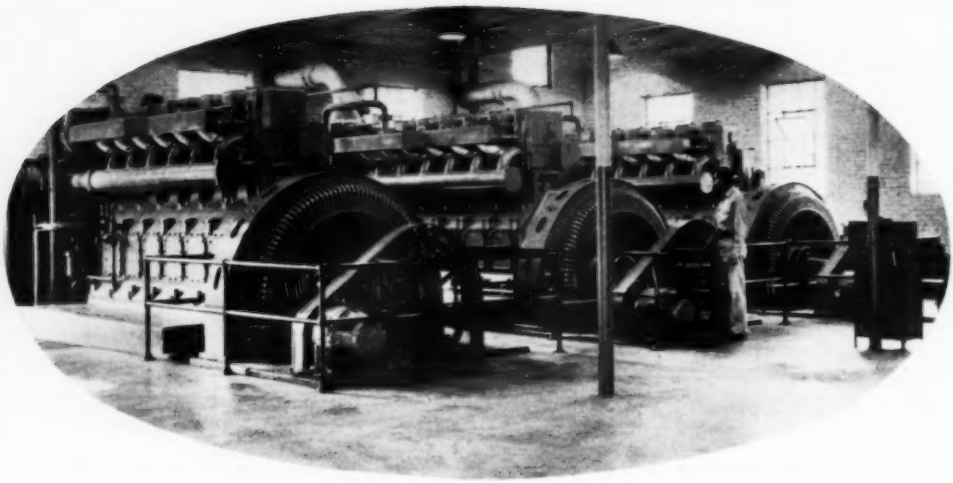
The receiver purifiers, rated at capacities of 130,000 lb per hr with efficiencies of 99.9% quality, were installed primarily to arrest occasional slugs of water that might result from priming or foaming, or failure of the automatic water regulators. Attaining a speed of close to 6,000 ft per min through the mains, the damage slugs can cause is serious enough to warrant the receiver purifier installation as insurance.

Cross section of the "slug arresting" receiver purifiers is shown in the inset. Receiver inlet and outlet are located above the center-point of the nine-foot-high chamber, and a slug entering the 12-in. inlet can occupy the lower half of the receiver drum without impairing the unit's separation efficiency. Lower portion of the drum will accommodate 262 gal of liquid and the 6-in. receiver drain permits total discharge within 10 sec in preparation for the next slug.

As steam enters the drum, a reduction of velocity allows the large masses of liquid (slugs) to drop. An internal down-flow purifier located at the top of the drum removes the remaining entrained water in the second and third stages of operation.

Purifier design utilizes the separating power of centrifugal force created by stationary, steam-directing blades, achieving high-efficiency separation with friction losses and pressure drop held to a minimum. Absence of moving parts holds down maintenance and servicing costs. The units will operate at double capacity without ill effect except for slight pressure drop.

While no power failure in the blast furnace powerhouse has been experienced within the past four years, installation of the automatic water regulators and the addition of the receiver-purifiers provide protection against the most unusual contingencies. Thus, the company assures continuous delivery of high-quality steam, with maintenance costs, entrained water and trouble reduced to a new and pleasing low.



These three diesel generating units supply all electrical power for Newton

NEWTON DECIDES ON DIESEL POWER CHANGE-OVER

Forced with operating an obsolete steam power generating system this community, to lower costs and improve plant efficiency, changed over to three 800-hp supercharged units. Average costs were reduced from 3.5 to one cent for each kw-hr generated during the first two months

NEWTON, ILLINOIS has been in the electrical production business since early 1894, when power was supplied from an Edison bi-polar direct current generator. This plant operated to light the streets at night when there was no moon. During the years that followed additional steam generating equipment and turbine generators were installed to supply electrical power, not only for municipal needs, but for commercial use as well.

It was not unusual that steam was favored in the early years of the plant's operation. Newton was favorably situated in regard to coal supply, being close to both Illinois and Indiana fields. The price of coal was such that the plant could be operated on a profitable basis. After more than fifty years of operation, conditions arose making it imperative that something be done to provide more economical performance if the plant was to continue in service. The price of coal had steadily increased. Generating units and boilers had become obsolete and maintenance costs were exorbibitant.

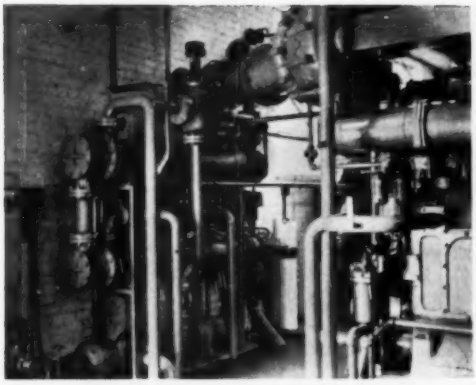
Rates had been reduced in 1938 and again in 1940, but in 1948 rates were raised in an endeavor to put the plant on profitable basis. In that year consideration was given as to what action should be taken to make the plant an asset rather than a liability to the city. Like many municipalities, Newton considered diesel power to replace the old steam equipment, and in 1949 they agreed upon three Nordberg supercharged diesels.

The first diesel was placed on the line in January, 1950, just five months after the order was placed. But before the engine could be placed in service, the steam equipment failed. At 2:40 p. m. on the last Monday of December the high pressure boiler developed a leak and the city was without service. Emergency repairs were made and power was restored at 9 a.m. the next day.

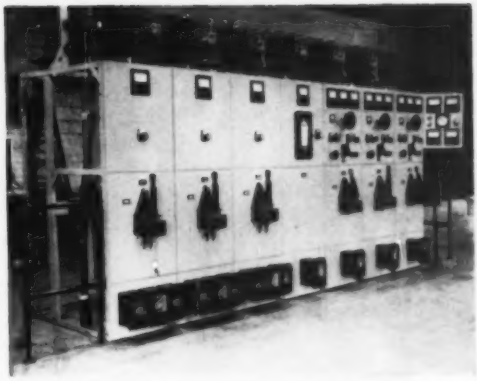
No addition to the building was necessary to house the diesel equipment, switchboard and auxiliaries. Sufficient space was provided by the removal of several abandoned boilers and a smokestack. Looking at the engine room now, one can scarcely believe it was ever a part of a dusty boiler room.

The three 800-hp units have six cylinders of 13 in. bore and 16-1/2 in. stroke and are of the four-cycle, supercharged design. They are direct connected to 560-kw, 3 phase, 60 cycle, 2400-v Electric Machinery generators that have V-belt driven exciters. Fuel is delivered to the plant by truck from a refinery 23 miles away and stored in two 210 bbl, vertical, above ground tanks. A Roper rotary pump acts as a double duty unit by handling fuel from the truck to storage and transferring it from storage to engine day tanks. This unit has a capacity of 35 gpm and is driven by a 3-hp motor. Fuel to the three day tanks is metered, and a record of consumption is maintained. Dual filters are located just ahead of the built-in engine transfer pumps, and all foreign matter is removed before delivering it to the injection pumps.

Since the former steam engines operated condensing, it was possible to utilize the existing tower for the closed cooling water system. There are two Worthington raw water pumps so arranged that either pump can serve any engine. These units have a 300 gpm capacity at 100 ft head and are driven by 10-hp motors. Suction is from the base of the tower, and discharge is through the lube oil coolers, jacket water heat exchangers and spray nozzles in the top of the tower. Jacket water is circulated by three 200 gpm



Shell and tube heat exchangers for jacket water and lube oil cooling keep the diesels at top operating efficiency



Seven panel switchboard services the generating units. Old switchboard was retained for street lighting circuits

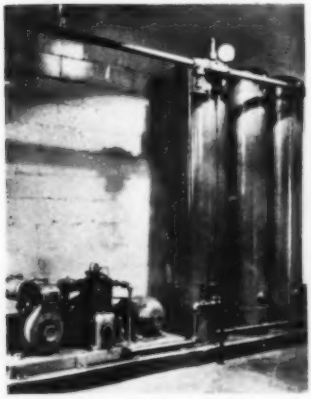
pumps at 65 ft head driven by 7½ hp motors discharging to three heat exchangers. These units can cool 200 gpm of jacket water from 160 to 145 F with 150 gpm of raw water from 113.7 to 133.9 F. Three automatic temperature regulators maintain jacket water temperature at 155 F. The water in this circuit is softened.

Lube oil for each engine is circulated by built-in pumps tied into the sump tanks. It is discharged through three heat exchangers, which have a capacity of 89 gpm of lube oil from 160-145 F with 150 gpm of raw water from 110 to 113.7 F. From the heat exchanger, the lube oil passes through a strainer located at the end of the engine and then to the lube oil header for recirculation. An oil purifier with 3-kw heater element by-passes some of the oil and returns the cleaned oil to the system. Each engine also has a hand operated before and after pump for lube oil. Controls for auxiliaries, visual and audible alarms for temperatures and pressures are located on the wall adjacent to the heat exchangers.

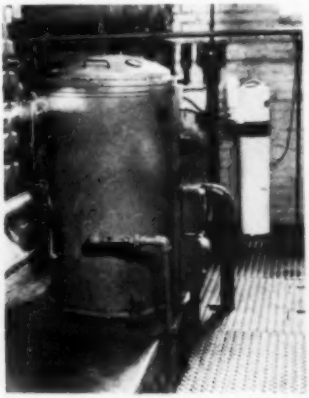
Air is filtered by three self-cleaning AAF oil bath cleaners and silenced by engine mounted silencers. Starting air is provided by a 19.8 cfm displacement, 250 psi, two-stage, air cooled Quincy compressor driven either by a 5 hp motor or a 6 hp engine.

A seven panel switchboard was installed, three for the generators, three feeder panels and one for a totalizing watthour meter. There is also a swing panel for synchroscope, frequency and power factor meters and two a-c voltmeters. The old switchboard has been retained for the street lighting circuits.

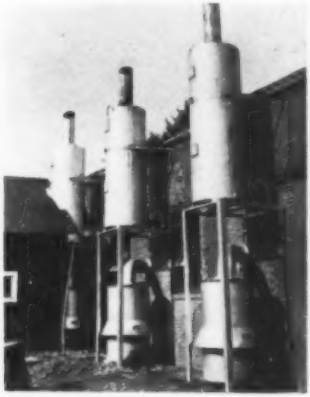
A comparison of generating costs of steam and engine operation shows a decided advantage in favor of the diesel. While no complete records are available on the steam plant, the cost per kw hr during the last few years, not including the period of high coal cost during the strike, averaged around 3.5 cents. Although the new plant has not operated long enough to stabilize generating costs, the cost per kw hr for the months of April and May shows a production cost of one cent. This includes fuel and lube oils, labor and maintenance. In this two-month period, 395,970 kw-hr were generated with 29,720 gal of fuel or 13.32 kw-hr per gal. The average load was 270 kw or 45% of rated capacity of one engine normally in service.



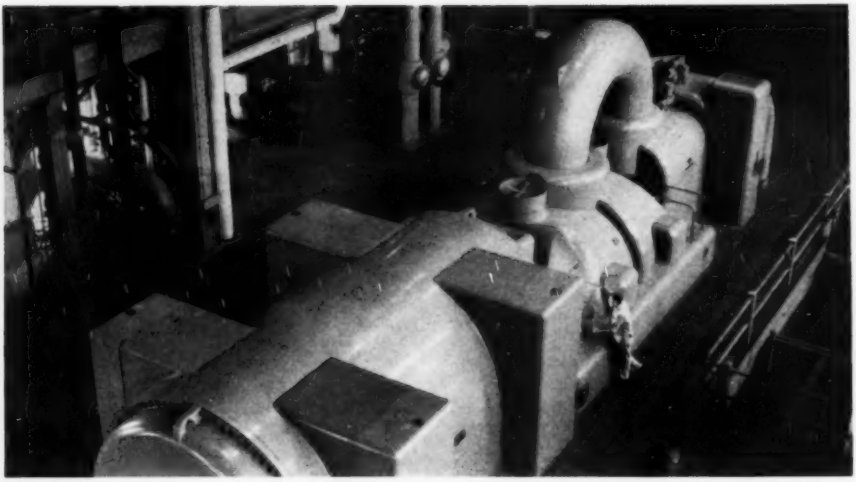
Two-stage air compressor, motor or engine driven, supplies the starting air



Lube oil is cleaned in this purifier. Water softener can be seen at rear



Scavenger air filter inlets and snubber exhausters are widely separated



Steam turbine with tailored topcoat is stream-lined and adds distinction to the general appearance of the unit. Each insulation piece is made from a pattern, cut exactly to size and molded to the casting

TAILORED TOPCOATS . . . . . .

. . for steam turbines require special fabrication techniques

EVERY turbine needs asbestos insulating blankets to conserve power-giving heat. As every turbine presents a special problem, the blanket must be a custom-made job. Even though the castings on certain types of turbines are identical, the outside pipes are made to suit the generating station where the turbines are to be installed. For this reason insulating blankets are designed to fit these pipes. First step in proper blanketing is to investigate the turbine engineering drawings. From these the locations of all the pipes and knobs can be obtained. From these data patterns are made from sheets of paper. Final fittings are made on the individual turbine generator, and alterations are made if necessary.

From these paper patterns, outlines are traced on asbestos cloth. A motor-

Asbestos covered cloth is cut from pattern with this hand operated tool. Covers must fit exactly to specifications

Special sewing machines are required for stitching the various blanket sections. The thread is asbestos coated wire

Blankets are filled with glass fiber, especially treated with plastic. This prevents the powdering of glass fibers

Heavy wire quilting keeps the stuffing in place in this odd shaped blanket. Wires are held in place with metal buttons

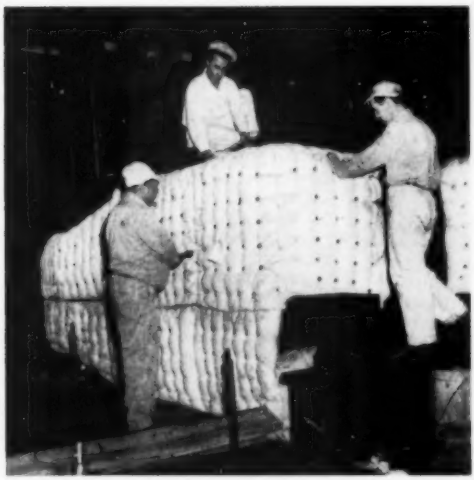
driven cutter, comparable to those employed in the cutting rooms of large clothing manufacturers, shears the heavy rock wool cloth into the weird shapes needed to fit the curves of the turbine castings.

Because different classes of turbines operate at different temperatures, the type of asbestos blanket differs accordingly. Blankets of asbestos cloth are good up to 950 F. At that temperature such cloth might crumble as the "threads" in the cloth are wires covered with asbestos. Though they are called blankets, these turbine topcoats look more like mattresses. They actually consist of two sheets of material with five inches of the edges stitched together. When a blanket is nearly complete, it is blown full of glass wool.

Blankets like these cannot be stitched on a conventional sewing machine. They are stitched with a thick cord made of asbestos wrapped around a heavy wire on a machine much like that used by a shoemaker.

Just as a mattress is quilted to keep the stuffing from shifting or bunching, the asbestos blankets are tufted with steel wire and washers. Some of these tufting "buttons" are equipped with hooks. When the blankets are placed in position, wire is laced back and forth between the hooks to hold the sections together. Modern design has streamlined the turbines with sleek outer covers of metal, so the customer rarely sees this fine handicraft.

Courtesy The Westinghouse News.



Blankets are laced snugly into place with steel wire. Metal buttons along the edge of the pad are equipped with hooks

Huge cross-over pipe, that carries the steam from one turbine section to another, receives final asbestos coating

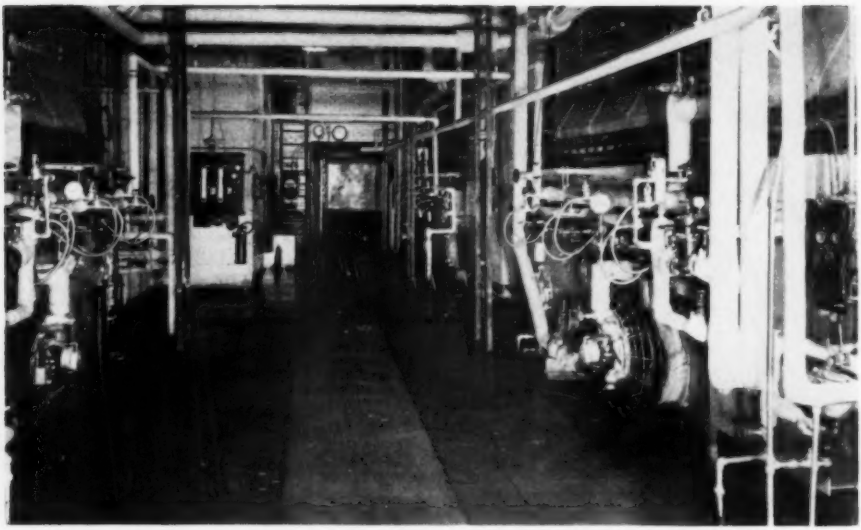


Fig. 1—Located in sub-basement of the Woolworth Building, this 150,000 lb per hr steam plant uses compact turbines on fans and pumps. Firing aisle is clear, make-up feedwater is obtained and the power costs are nominal

WHERE STEAM AUXILIARIES MEAN SPACE AND FEEDWATER

GUY MANKIN, JR., L. J. Wing Mfg. Co.

REQUIRING additional facilities to generate steam for its expanding heating and process loads in lower Manhattan Island, and after considering the congested building situation in that neighborhood, The New York Steam Corp. decided to locate a new steam plant in the sub-basement of the Woolworth Building on Broadway. The consulting engineering firm of Burns & Roe were engaged to carry out the program.

Three boilers, with a steam capacity of 50,000 lb per hr per boiler or 150,000 lb per hr total, comprise the main generating equipment. Normal operating load, oil fired, is 37,300 lb per hr per boiler or a total of 111,900 lb per hr. Each boiler was designed to operate against a maximum line pressure of 200 psi and normal operation is between 150 and 165 psi, fluctuating with the demand.

Since much of the steam generated leaves the building with no possibility of condensate recovery, auxiliaries are driven with steam turbines rather than electric motors, and the oil-free turbine exhaust is used for make-up feedwater and fuel-oil heating. Thus, the power to drive the auxiliaries, such as forced draft blowers, fuel-oil and feedwater pumps is nominal in cost.

Each boiler is equipped with a turbine-driven axial-flow forced-draft blower mounted directly on the oil burner wind-box. The photograph, Fig. 1, shows how this unique mounting arrangement makes for compactness, keeping the firing aisle clear and unobstructed. Each blower furnishes a maximum of 15,200 cfm at 3.4 in. static pressure at 105F, with a normal operating requirement of 11,560 cfm at 2.7 in. pressure at 80F, when sup-

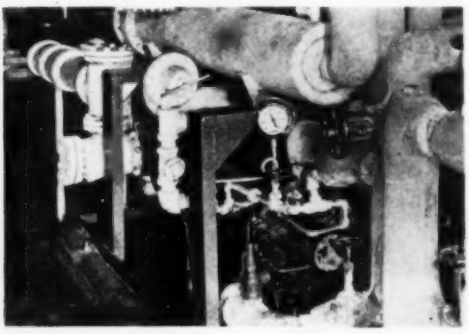


Fig. 2 — Another example of space saved by turbines. Size and ability to operate under high temperature conditions allow installation of fuel-oil pump in midst of steam piping and valves

plied with steam at a maximum of 200 psi saturated and at 5 psi exhaust.

Speed of each turbine is controlled by a chronometer valve installed in its steam line and actuated by an automatic combustion control system. Thus an economical air-fuel oil ratio is maintained for efficient performance.

The two fuel-oil supply pumps are direct-connected to the steam turbines and operate at a maximum of 1150 rpm, developing 5 bhp with the same steam conditions used for the forced draft blowers. Each pumping unit operates alternately, taking oil from the storage tanks at 130F, pumping it through the fuel-oil heater, and then to the burners at 80 psi and 180F. When the plant is developing its maximum load of 150,000 lb per hr, each pump delivers 1100 gph of oil.

Fig. 2 shows the compactness with which the turbine-driven fuel-oil pump and piping can be installed when compared to other drives which are not as heat and moisture resistant as a turbine-drive assembly.

Two feedwater pumps operate alternately and deliver 450 gpm at 680 ft head at 212F.

Exhaust from the auxiliary turbines is delivered to the feedwater heater and fuel-oil storage tank at a pressure of 5 psi. This, plus condensate returns from heating the Woolworth Building, represents approximately 17% of the maximum capacity of the steam generating plant.

In addition to the economy of using steam for a double purpose — namely, driving the auxiliaries and heating the feedwater and oil — the plant is largely independent and self-contained and can assure the customers served in lower Manhattan of a continuous supply of steam, regardless of any external power interruptions.

PRINCIPAL EQUIPMENT USED IN THE WOOLWORTH STEAM PLANT

Boilers	The Babcock & Wilcox Co.
Oil burners	The Babcock & Wilcox Co.
Forced-draft fans	L. J. Wing Mfg. Co.
Forced-draft fan turbines	L. J. Wing Mfg. Co.
Oil pumps	DeLaval Steam Turbine Co.
Oil-pump turbines	L. J. Wing Mfg. Co.
Combustion controls	Hagan Corp.
Boiler feed pumps	Ingersoll-Rand Co.
Boiler feed pump turbines	The Terry Steam Turbine Co.

Mechanization Speeds Sewage Disposal System

Digging, laying and backfilling on 8100 ft of vitrified clay line moved rapidly when every operation but sealing of joints, right, was completely mechanized

• Construction of Lever Brothers new plant in Los Angeles is scheduled for completion early this year and involves the largest industrial investment by private capital in the history of Los Angeles County. This huge plant will occupy 30 acres with a building area of nearly half a million sq ft.

The sewage disposal system of the plant involves some interesting problems in sanitary engineering. To combat corrosive action of industrial wastes from the manufacture of soaps and food products, 3,500 ft of vitrified clay pipe within the plant grounds and an additional 4,600 ft outside the property are incorporated in the sewage system. The layout requires 29 catch basins.

Engineers designing the sewage disposal system naturally strove for the economies of a gravity system. Only one inverted siphon was required, and gravity flow was attained by varying trench depths from 5 to 14 ft.

Highly mechanized methods of laying sewer lines were employed in the project. Diesel-powered trenching machines dug trenches at high speeds. More critical digging was done by truck-mounted, clam-shell excavators. Pipe sections were lowered into trenches by truck-mounted power cranes.

Even the fitting of the bell joints of the clay pipe was partly mechanized. The pipe was swung into position by a power crane to help fit the joints. The jointing compound was poured into place in a semi-liquid state from bucket applicators.

To insure corrosion-resistant joints, compounds of coal tar with 20-30% mineral filler were employed in accordance with the Los Angeles County engineering specifications.

After the pipe was laid and inspected, bulldozers were used for backfilling the trenches. Clam-shell excavators assisted in the operation.

The plant will employ 600 or more people. It is modern in design and functional in arrangement, utilizing the most advanced equipment, machinery and manufacturing practices to serve the needs of a phenomenally growing community. The plant will also be a large customer of that area in the purchase of raw products, handling approximately 180,000 tons of raw and finished products a year.

Located in the rapidly growing and extensive industrial section in the easterly portion of Los Angeles, the plant reflects the foresight of the officers of the Lever Brothers Co.

Bechtel Corporation, specializing in the design and construction of chemical and industrial plants, power plants and refineries, is responsible for complete development of the project, including structural design, procurement, construction, and installation.

BUICK LIKES MAGNETIC CLUTCHES

Because wide speed control is provided with standard a-c motors supplied current from regular shop lines; speeds are held within 0.5 per cent plus or minus; and speeds can be varied from 17 to 1 and 2½ to 1

HERBERT CHASE, *Consultant*

AT THE BUICK MOTOR DIV., General Motors Corp. plant in Flint, Mich., the applications of power are highly diversified. When equipment, including machine tools, has to be driven at varying speed, special problems arise. Some pieces of equipment have their own speed and torque changers, generally mechanical, hydraulic or pneumatic but, in others, plant engineering is called upon to provide the means for varying speed.

As power lines are all alternating current the motors are basically constant speed units. If electrical means of speed changing are required, one common expedient is to use a motor-generator to provide d-c and vary the field current in motors driven off the generator. This requires heavy investment. Wide speed control is provided, but, besides being costly, this has some drawbacks certain of which can be serious. Commutator and brush troubles occur and special power lines have to be run from the generator to motors and must be changed if motors or machines are moved. If a broken field circuit occurs and a motor runs away, the results (such as a bursting grinding wheel, for example) might be the cause of a fatal accident.

For these reasons, although some motor generators are still used, it is preferred, where possible, to employ eddy current clutch drives. These involve the use of a constant-speed a-c motor connected to the regular shop lines. The motor drives the machine or other equipment through an eddy current clutch whose output shaft speed is varied between wide limits by the simplest means: mere variation in the small current that energizes the clutch.

This direct energizing current is provided from a rectifier on an electronic control panel. Current can be varied by a simple rheostat or potentiometer. Should a break in this circuit occur, the clutch no longer transmits power and the driven machine stops. On the other hand, speed control can be within a plus or minus 0.5 per cent and the speed reduction can be somewhere between 17 to 1 and 2½ to 1, depending on the power and speed of the driving motor and, of course, the needs to be met for flexibility of operation.

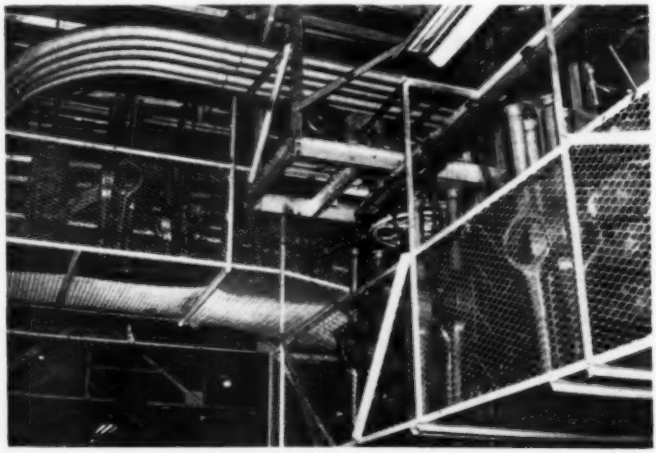
These results are attained by standard eddy current clutch units of which several score are in use at Buick. A majority of these are motors but some are used as absorption dynamometers in special testing equipment and are particularly useful in certain rear axle, differential and transmission testing because the drive can be from either end of the unit tested.

Units of this type are essentially constant torque, as input torque equals output torque at any speed. Loss of energy in the clutch is in direct proportion to the speed difference or slip, and this loss is converted into heat that is dissipated by air or water moved by vanes on the clutch drum. This loss is not large and does not result in excessive temperature rise. In fact, one unit, employed on a crankshaft grinder, has been run for a long period covered with a tarpaulin that virtually closes the unit, yet no excessive temperature rise took place.

This experiment was made, however, primarily to exclude steel particles picked up from the air by magnetized portions of the clutch in the open-frame unit employed. Closed units are now available that will be free from this trouble. However, this has not been a significant factor in any save the grinder drives.

On production grinders, of which large numbers are used in Buick plants, there is, of course, one optimum peripheral wheel speed for any given set of grinding conditions. In average grinders, a certain wheel rpm is chosen for a given grinding wheel diameter and remains set for considerable periods even though the wheel's peripheral speed decreases slowly as the wheel wears. After some inches of wear occur, sheaves driving the wheel commonly are changed to again restore the proper peripheral speed.

At Buick, many grinders, including eight Landis machines on crankshaft



This axle conveyer, driven with a perfectly synchronized eddy clutch, can deliver axle housings along the plant production line at any desired rate of speed

operations and three Cincinnati centerless machines, have been equipped with the eddy current clutch units. All the operator need do to change wheel speed is to turn a hand wheel that adjusts a potentiometer. An instant change is effected to compensate for wheel wear, no sheave changes being needed throughout grinding wheel life. This is a great convenience and also insures optimum grinding speeds at all times. There is no possibility of the wheel running away, as the driving motor of the unit is a standard a-c constant speed type running off a regular shop line. Drives of this type can be applied to any machine tools, especially when they do not come equipped with their own speed changing equipment built in.

Another application of the eddy current clutch drive is to chain conveyers. Normally, this type of conveyer operates at constant speed, but the speed can be varied if production requirements are altered.

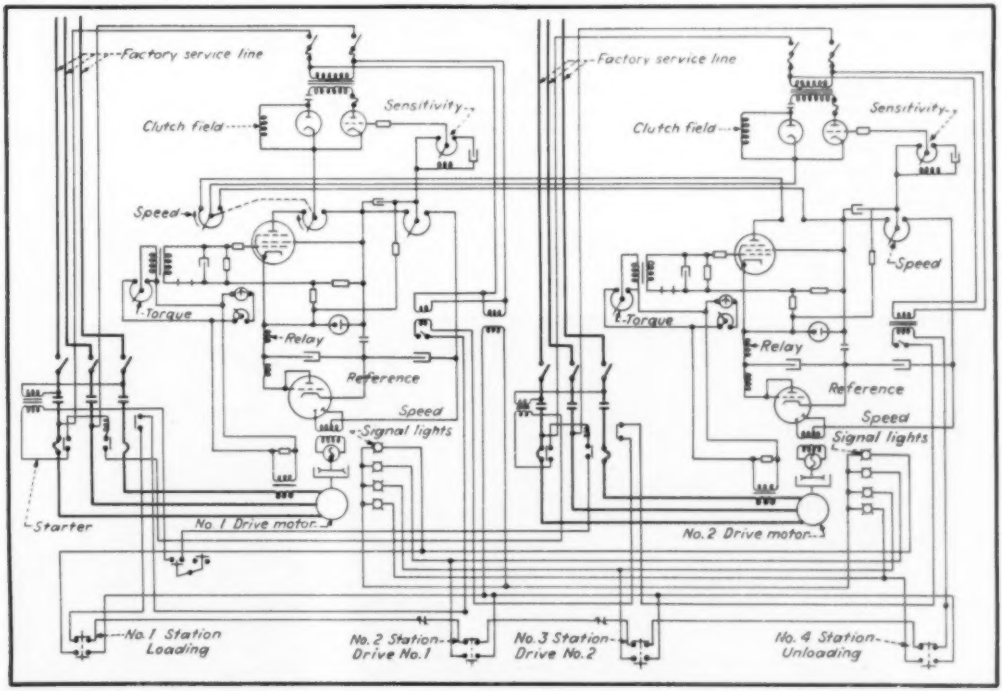
One marked advantage of this drive is that the torque applied can never exceed that of the driving motors. If anything happens to jam the conveyer, the eddy current clutches merely slip, with no torque increase, until the drives are stopped while the jam is being eliminated. This is important because, if a conveyer is broken (as can occur with some drives), the whole operation served must be shut down until the break is repaired.

Another advantage is that, although all the driving motors, at widely separated points, are connected directly to the handiest power line only five No. 14 wires in a conduit are needed to interconnect the clutch circuits of the units. This line leads to a common control panel and the conveyer speed can be set or varied to have the chain sprockets driven at precisely the same rate of speed.

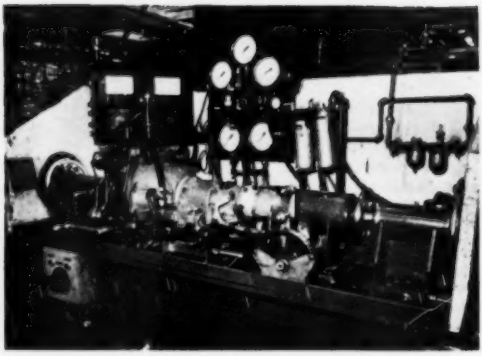
In still another case, an eddy current clutch drive is applied to the hoist of a bridge crane. When a load is picked up by this crane, the cable pull is perfectly balanced by the torque of the eddy current clutch and the load can, if desired, be moved up or down by hand, so sensitive is the balance. Clutch failure would not lower a load, as the hoist is equipped with a conventional mechanical brake. The main advantage of this drive is precision control of hoisting and lowering speeds when the crane is used for die setting.

Many eddy current clutch units are employed in several setups for testing rear axles. In each such setup, there is a 50-hp unit turning at 3,600 rpm arranged to take the place of an engine in a car and drive the propeller shaft extending back to the rear axle with a hypoid bevel gear and differential. In place of each rear wheel and connected to the axle shafts that extend from each side of the differential carrier is a 25-hp, 720-rpm eddy current clutch unit. The test is conducted in a soundproof room.

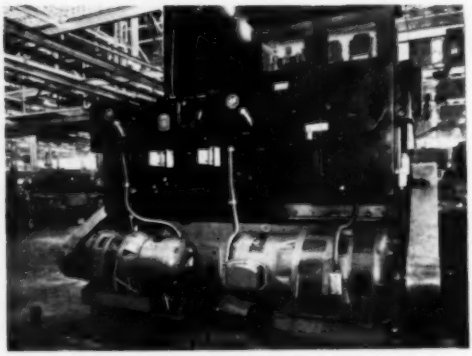
Purpose of each testing setup is,



Standard wiring diagram for dual-drive eddy current clutch tied into three power units spaced along the line and synchronized to drive the conveyer at three widely separate points. Motors are connected to shop's electrical circuit



This Buick Dynaflow transmission test stand includes two eddy current clutch units for driving and absorbing the power



Smaller unit supplied power at high speed, other absorbs transmitted output at lower speed for test setup, right

first, to drive the propeller shaft and, then, to absorb the power transmitted through the bevel gear by eddy current clutch units connected to axles. If the latter (driven) units both turn at the same speed and absorb the same power, the differential pinions have no relative motion, as they remain inoperative. But if the driven units are set to absorb different amounts of power and vary in speed, the differential pinions rotate, just as they would in a car being driven around a corner.

In other words, the axle can be made to simulate road conditions and, while so doing, any noise developed in the driving or differential gears can be heard. If the noise is excessive, suitable adjustment can be made or noisy parts replaced. This check on noise during power transmissions is, in fact, the primary purpose of the test setup. The latter is also used with the two axle units driving and the 50-hp unit absorbing power. If such driving is done at a different speed for each wheel motor, the differential pinions again rotate and are checked for noise. This simulates a condition like that in which a car rounding a curve drives the engine, which then acts as a brake, as in descending a grade.

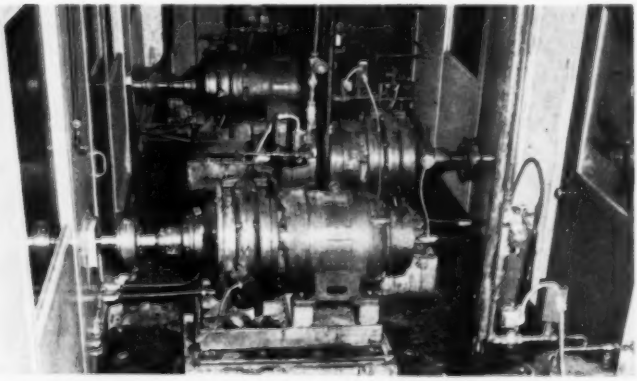
Accuracy of Tests

With setups of this kind, the eddy current clutch units afford a very convenient and flexible means of testing under controlled conditions. Tests made on them simulate road testing and make the latter unnecessary, as far as axles are concerned, besides affording controlled testing conditions in place of the uncertainties of road testing accuracy.

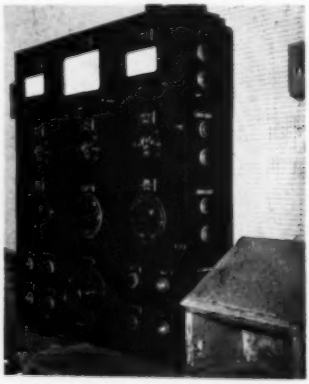
To test Buick "Dynaflow" transmissions a hydraulic torque converter as well as two sets of planetary gearing are employed. In this setup (of which 12, in all, are now in use) there are two eddy current clutch units for each test fixture. In effect, one unit of 20 hp, turning at 1800 rpm, takes the place of the engine in a car and drives through the transmission to the absorption unit, which is belted to a pulley on what corresponds to the propeller shaft in a car. This absorption unit turns at whatever speed the transmission may be set.

With a setup of this kind, the transmission can be tested under various loads and speeds. It can also be checked for noise in the planetary gears that are employed in low and reverse positions.

Numerous other applications of eddy current clutch units have been installed in the Buick plant but those described above make it evident that such units are made to perform a large variety of functions and have established their utility and convenience on many scores.



These four units are components of two axle testing setups located in a soundproof room. Each setup contains three eddy current clutches to absorb or supply power



Control panel for each test setup is located in the soundproof test room

PUMP STRUCTURAL SPECS

R. J. MacMEEKIN, Chief Engineer, Economy Pumps, Inc.

CENTRIFUGAL PUMPS of medium and large sizes for general service and moderate temperatures most frequently are double-suction, single-stage units of general design illustrated on these pages.

Specifications often call for smooth passages and sturdy construction, with water-seal rings added for good measure. But these are generalizations and such a specification does not accomplish much. If this is true, just what are the earmarks of a modern well-engineered pump? And what points of design should be sought in purchasing such a pump?

The capacity and pressure are specified, of course, and must be met by whatever pump is chosen, and the guaranteed efficiency is a measure of the hydraulic excellence of the pump.

The casing should be strong enough for the pressure encountered in service, and should be able to withstand one and one-half times the working pressure. There is, then, not much to specify regarding the casing if the service is cold water at a pressure under 125 psi.

If the pressure exceeds this value, it is well to indicate the flange standard expected, since on cold non-shock service the 125-psi standard flange is satisfactory to 175 psi working pressure, and will be safe under the corresponding 263-psi hydrostatic test. If it is to withstand shock, this fact should appear in the specifications. In all cases, the temperature must be stated. If it exceeds 180F, the gasket should be of asbestos or other heat-resisting material.

When there is a positive head on the pump suction, as there must be on hot-water units and frequently is on those handling cold water, the lantern ring should be omitted and the box packed solid.

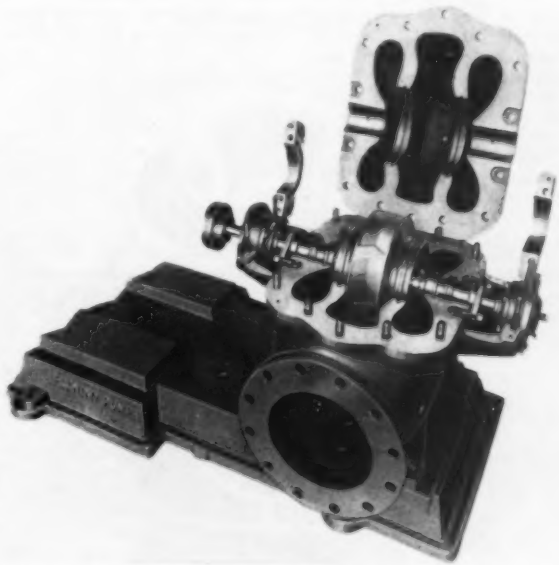
It is usually not worthwhile to have water-cooled stuffing boxes unless the temperature is in the 500-F range, which means a specially-designed high-temperature pump. The chief virtue of water-cooled stuffing boxes is to shield the bearings from heat. In any case, they dissipate valuable Btu and use water. Their effect is to cool the outside of the packing. But the inside is still in contact with the hot liquid and rubs the hot shaft.

The shaft should be stiff enough to prevent the seal rings rubbing when starting and stopping, and to provide smooth operation and assurance against fatigue failure. The impeller keyway should be side milled to give sled-runner keyway; not end milled. Preferably, there should be no threads on the shaft at the impeller to start fatigue failure.

Shaft size should be considered from the standpoint of its diameter and of its span from bearing to bearing. Remember the deflection varies inversely as the fourth power of the diameter, but directly as the span cubed, approximately. The impeller should preferably be dynamically balanced.

Best practice is to place the shaft nuts at the outer ends of the shaft sleeves. This serves the dual purpose of moving the threads away from the region of greatest shaft deflection, and keeps the shaft diameter large out to the outer ends of the sleeves.

There should be packing between



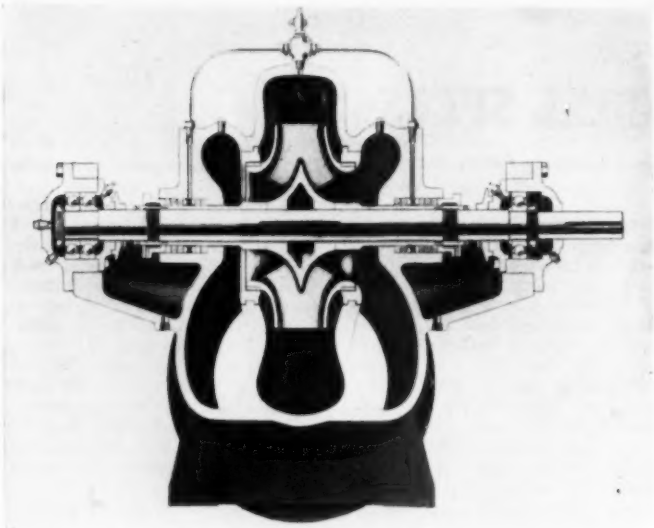
Enclosing cartridges permit rotor removal without exposing bearings to dirt or moisture. Removing inboard ball bearing is sometimes a lengthy dismantling job

the shaft and shaft sleeve so air cannot leak in and make priming difficult or impossible. It is also useful if there is a positive suction head on the pump, particularly for hot water or gasoline, where leakage outward under the sleeve would be objectionable.

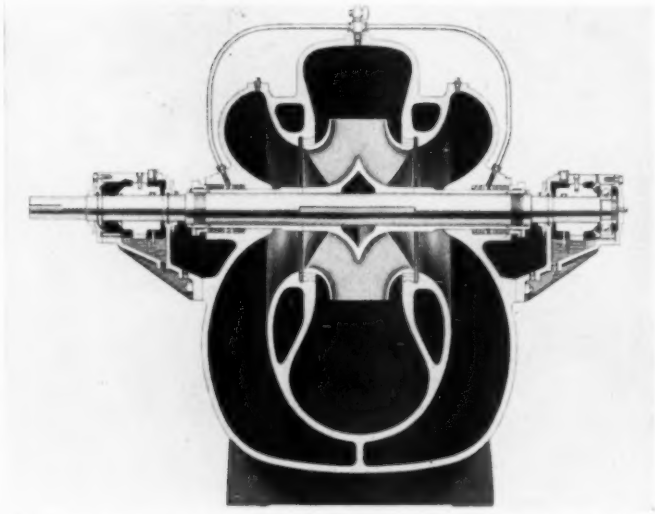
Shaft sleeves preferably should not be threaded. It is better to drive them by a key. Sometimes the same key is used to drive the impeller and sleeves.

One objection to threaded sleeves is that they must be threaded in a direction so the packing drag tightens the sleeve against the impeller, rather than tending to loosen it. This means one right-hand and one left-hand sleeve. Aside from the confusion inherent in repairing machines having some left-hand threads, there is the fact that the two sleeves are not identical or interchangeable. Likewise, if you use two pumps, one right- and one left-hand unit, both having threaded sleeves, the shafts will be different. But, with key-driven sleeves the shafts can be identical.

Another point is that with keyed-sleeve construction, a pump can be converted to opposite rotation without buying new parts. Simply reverse the impeller on the shaft and reverse the casing on its bed. This flexibility may be required in large mills where pumps are sometimes shifted from one application to another.



Keyed sleeves are handier than screwed ones, and sleeve packing prevents leaks between sleeve and shaft. Duplex ball bearings are suitable for thrust loads



Sleeve bearings are easy to service because they can be rolled into place by opening bearing case and blocking up shaft. This unit has single-ball thrust

Sleeve Hardness

Preference should be given to shaft sleeves having hardness of 175 BHN as compared to perhaps 60 in ordinary castings, assuming in both cases, that bronze is the material used. Bronze casing rings and glands are considered better-quality construction than iron.

If ball bearings are used they should be enclosed in cartridges, not in a bore in the casing bracket. Cartridges should be arranged to permit rotor removal without exposing the bearings to dirt or moisture.

The cartridges should have their closed end away from the center of the pump. The bearing race is a hand-push fit in the cartridge and it can be pulled off easily, exposing the bearing so a puller can be used. Ball bearings are a press fit on the shaft, and they may be damaged if pressure is applied against their outer race to remove them. It is an important point of design that the puller jaws be able to reach the inner race, or the shaft shoulder ring to remove the bearing without damage.

The best ball thrust bearing, size for size, is a duplex unit—a pair of angular-contact bearings. Another factor of importance is bearing size. Grease lubrication is reliable and requires but infrequent attention. The grease also helps seal out dust and moisture. Oil lubrication is also widely used.

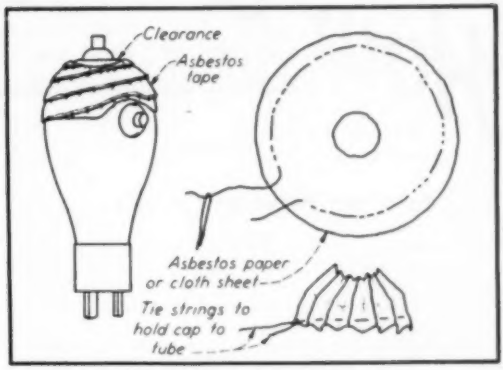
On very large pumps it is easier to service a sleeve bearing, because the bearing halves may be rolled out and new ones rolled in merely by removing the bearing cover. In the case of an inboard ball bearing, one must open the casing, remove the rotor, pull the coupling and use a puller on bearing.

A sleeve-bearing pump may well have a ball bearing arranged to take only the thrust load. This unit can be taken from the pump without removing the rotor. Ball bearing failures are rare in conservatively designed pumps.

When

TUBE AMBIENTS EXCEED LIMITS

Keep electronic equipment using mercury tubes operating properly in spite of those sudden temperature changes. These temporary measures maintain correct heat balance within the tubes until faults are permanently corrected



If cooling air hits top of tube, use cap of tape, left, or sheet, right. Longer version makes jacket to conserve heat

ELECTRONIC CONTROLS, now found in many applications in the average plant, often have hot cathode mercury tubes, including the rectifiers and thyratrons, as important components. Although designed to operate within reasonable temperature limits, these values cannot be exceeded without contributing to breakdown or erratic behavior.

Original application of controls is usually well engineered and ambient temperatures given adequate consideration. However, changes in plant layout, seasons or operating schedules often cause unforeseen ambient temperature variations.

Also, old tubes usually show first signs of failure when ambient temperatures approach the limits for good tubes. Holding the surrounding temperature to close limits may keep a worn thyratron in service until a replacement can be obtained.

Auxiliary cooling or heating may be provided with fans, portable heaters, strip heaters or other means at hand. These methods, however, must be used with caution and with an understanding of temperature effects on mercury tubes. Otherwise, tube operation and life may be adversely affected.

Temporary Cooling

Operating characteristics of mercury tubes depend on internal mercury vapor pressure and therefore temperature. The excess of mercury, normally condensed on the lower inside walls of the glass bulb, is continuously evaporating and condensing at a rate and pressure determined by temperature. Condensation is greatest on the cooler surfaces and the mercury will ultimately migrate to them. In properly designed tubes, coolest surfaces are at the bottom so that mercury cannot condense above, and fall onto, the electrodes, causing the tube to "arc back" on reverse polarity or to lose control in the forward direction.

Temporary cooling should follow rules for permanent ventilation, if possible, and air should flow upwards along the sides of tubes. Where this is impracticable and cooling air must come from the side or above, tops of the bulbs must be shielded and prevented from being excessively cooled.

Shield Top of Tube

The insulating cap illustrated is generally applicable. Asbestos cloth tape is suitable and usually available. Start wrapping tape horizontally around the bulb just above the largest diameter. After the first turn, sew the tape to the preceding turn with string or thread. A hairpin of wire will serve as a needle.

Top of the cap is finished with a hole for the anode connection. Edges of the hole should be bound back with string to provide adequate electrical clearance to the metal terminal. Similar precautions should be taken for other connections, such as screen-grid terminals on the sides of tetrodes.

Asbestos cloth or paper may also be used by cutting a roughly circular piece with a hole in the center.

Be careful in choice of materials that they are not conducting. Damp materials and asbestos cloth or tape that is reinforced with wire should not be used. Clearance around terminals must be provided and maintained against vibration and air flow because of possible absorption of moisture during down periods.

Low Ambients

Low ambient temperatures may be indicated when tubes conduct weakly or not at all. Assuming that a draft shield or an extra hour of morning warm-up period, as conditions require, is inadequate or impossible, portable heaters may be used to advantage. Warm air units are best because of the even, more easily controlled heat. Radiant types of heaters are satisfactory but care must be used that tubes are not overheated by direct exposure, especially on the lower parts of the bulb where condensed mercury may absorb extra heat. Radiant heat is best applied to the outside of the case, allowing the warmed walls to heat the interior.

Often simplest means of warming tubes is to enclose each in an insulating jacket. Construction may be similar to the asbestos cap. However, the jacket should extend well down the sides so as to confine the cathode heat to the whole bulb. Remembering that the coldest surface determines mercury pressure and location of condensation, however, the lower portion of the bulb should be exposed by an amount which will depend on ambient temperature.

Temporary heating measures must be carefully watched after the control is returned to service. Heating effect of load current may be as great as that of the cathode and, combined with the other heat sources, may raise tube temperature above the upper limit.

How to . . Shop Kinks and Hints . .

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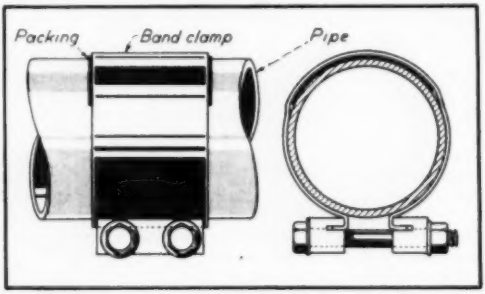
Serviceable Repair for Pipe Leaks

A satisfactory repair for a pipe leak, which can be left on permanently even under high pressure, can be made in the following manner: Get a piece of heavy sheet steel large enough to cover the damaged area, and bend each end U-shaped as shown in the sketch.

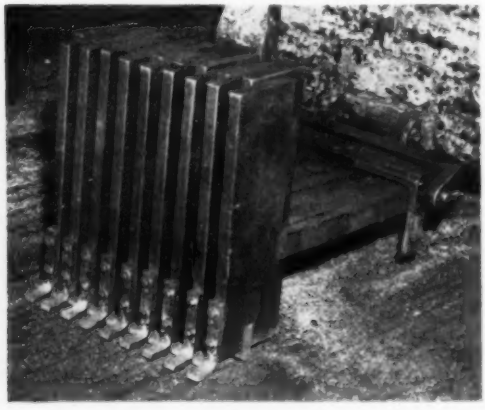
Next make the two clamp bars. The ones we made came from 1 x 1-in. bar stock 3 in. long and was used on a 4-in. pipe. The clamp bars were drilled for 1/2-in. bolts and



grooved as shown to take the lips of the sheet steel. A piece of sheet packing was placed over the leak and the clamp bent around the pipe. After putting the clamp bars in place the patch was tightened.—*Frank M. Butrick, Jr., Alma, Mich.*

Scraper Loosens Gummy Floor Deposits

When floors in factory or machine-shop aisles become oily or sticky they accumulate dirt, oil and chips that cannot be swept up. In Plant 28 of the Buick factory, Flint, Mich., gummy floors are cleaned with a simple scraper (photo), which is towed along by a lift truck.



The cleaner consists of 18 slabs of 1 x 6-in. steel 20 in. long set on end. Welded to each weight, about one third of its height from the ground, is a 1 x 2-in. tow bar pivoted on a cross pin at the forward end. On nine of the weights, the bar is 18 in. long and on the other nine it is 20 in. long. This staggers the weights.

Set into each weight at the middle of its lower end is a 1 x 1-in. planer-shaped tool-steel bit fastened by recessed set screws. Tool is kept from digging into the floor by an adjustable shoe on the rear bottom corner of each slab.

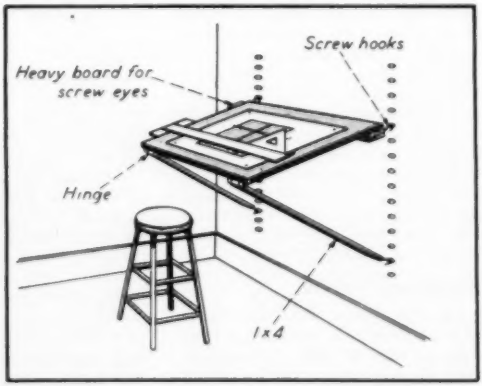
Having several weights, the device accommodates itself to floor irregularities. It is not expected to effect a perfect cleaning job, but does perform its objective of loosening gummy deposits.—*Herbert Chase, Forrest Hills, N. Y.*

Drawing Board Folds Away When Not in Use

Our shop office is pretty crowded with desks and filing cabinets. I needed a drawing board occasionally, but there was not room for a board and stand.

Screwing two large hooks into a strip of wood, I fastened the strip to one side of the board as in the sketch. A pair of hinges and two more strips of wood having hooks in their ends, were fastened to the same side of the board, but at the opposite edge.

Into the wall back of my desk, I screwed two rows of



eyes. All I need do, when I want to use the board, is place the hooks in the proper screw eyes and go to work. Changing hook position varies board angle and height.—*Frank M. Butrick, Jr., Alma, Mich.*

BRASS PIPE AND COPPER TUBING

W. J. RYAN, *Technical Manager, Water Service Laboratories, Inc.*

THREE KINDS of brass pipe are ordinarily used in water-supply systems. Two are known as yellow brass and the third is called red brass. The two yellow brass alloys include Muntz metal, which is approximately 60% copper and 40% zinc; and the so-called high brass, or alpha brass, which is 67% copper and 33% zinc. Red brass has about 85% copper and 15% zinc.

Corrosion of yellow brass (both Muntz metal and high brass) takes the form of dezincification, which dissolves zinc from the brass alloy and thereby weakens the structure of the metal so that leaks and breaks occur. These usually start at screwed connections where the pipe wall is thinnest. Primary cause is reaction between the metal and corrosive gases in the water.

Experience to date indicates that red brass is, generally speaking, more resistant to corrosion than any of the other materials commonly used for water pipes; but exceptionally corrosive waters will dissolve sufficient copper from red brass to deposit blue-green stains.

The susceptibility of yellow brass pipe to corrosion has now become so well known that leading manufacturers no longer recommend or offer it for plumbing systems. They recommend red brass and copper which, although more resistant, are not immune to corrosion.

The two most common types of dezincification are the so-called plug and layer type. The plug type is analogous to the pitting of iron pipe and is concentrated in spots where a plug of pure copper is left in the pipe wall after the zinc has been removed. Location of the corroded spot is shown by a white blister or tubercle of zinc oxycarbonate, which forms over the plug. When a plug occurs at a screwed connection the pipe is likely to break at the threads. Such plugs are made easily visible to the naked eye by hacksawing through the white tubercle and polishing the cut section with emery paper.

The action of certain waters is to remove the zinc from the entire inside surface of the pipe, this being known as layer type dezincification. The pipe may look sound under superficial examination and not show the tell-tale tubercles, but if a piece is split lengthwise and flattened, the whole inside surface of residual brittle copper disintegrates and falls away. When this type of corrosion has made much progress, numerous leaks occur at screwed joints, and very extensive replacements become necessary.

The life of a piping system may be prolonged and the expense for pipe replacements minimized by applying suitable treatment to the water to counteract its corrosive characteristics. For this purpose, many cities throughout the country treat their entire water supply with lime because that is the cheapest material to use. It is impracticable to feed lime into the water supply of an individual building, and to check such corrosion, it is a widely established practice to use an alkaline solution with a sodium silicate base. This treatment has no adverse effect on the potability of the water.

One of the reasons for the increasing use of copper tubing is the expectation that it will be immune to corrosion, but experience has shown that pitting takes place in certain waters and the pipe wall may be completely penetrated after only a few years' service. The rigid type of tubing is not annealed and the metal is under permanent internal strain, which condition is acknowledged by metallurgists to be conducive to corrosion. Furthermore, the tubing has a very thin wall, about ¼ to 1/3 that of standard steel or brass pipe.

Another indication of corrosion in copper tubing is the blue or green color that may be imparted to the water, or the blue-green staining of white porcelain fixtures. This discoloration can be eliminated by treating the water.

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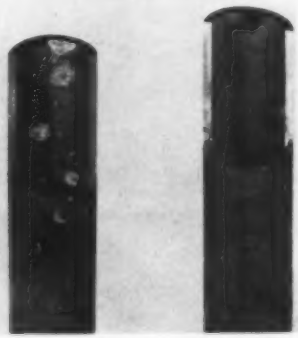
Typical plug-type dezincification in a cross-section of yellow brass pipe



Brass pipe (left) shows dezincification. Right one has protective film

TYPICAL USERS

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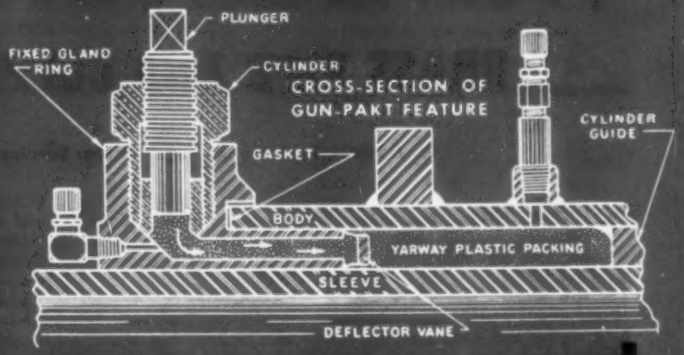
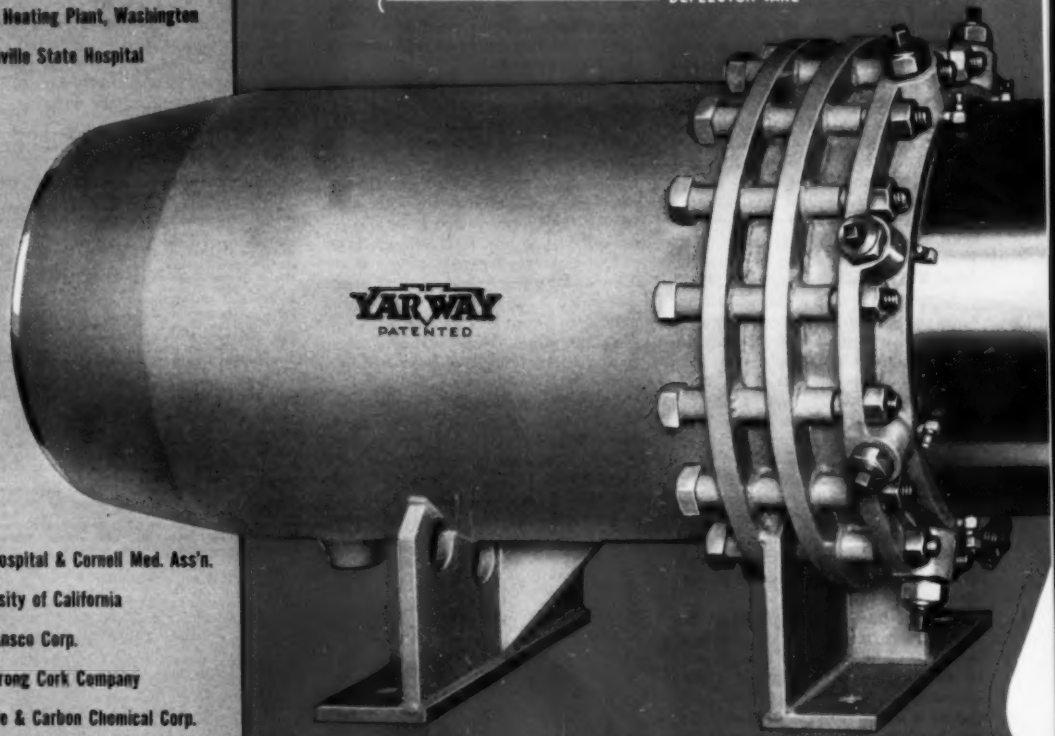
Sanitary District of Chicago
City of Cleveland
Florida Power & Light Company
Georgia Power Company
Philadelphia Electric Company
Dayton Power & Light Company
Camarillo (Cal.) State Hospital
Central Heating Plant, Washington
Jacksonville State Hospital

this expansion joint





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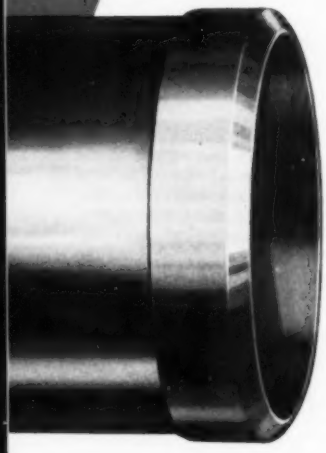

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Spot News

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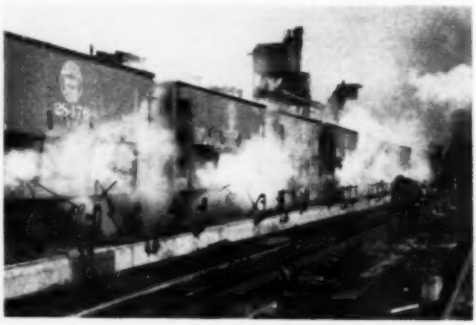
Ore Shipped by Rail Reaches Chicago in First Attempt to Move Shipments after Lake Freeze

United States Steel Company's South Chicago plant has begun thawing an experimental shipment of 50 carloads of frozen ore from the Mesabi range in Northern Minnesota. It is the first time ore has been shipped by rail in winter.



Normally the ore is moved by boat during the Great Lakes navigation season with stockpiles carrying the mills over the winter months.

This winter, U. S. Steel plans to ship two million tons to plants in Chicago, Gary, Ind., Pittsburgh and Youngstown, O. Because South Chicago mills lack space for thawing the ore, the cars were placed on a siding. The thawing process consists of piercing the load of ore with a steel nozzle and applying steam. The steam works through the load and drives out the frost. It takes about eight hours to thaw a car of ore. Four old locomotives leased from the Burlington Railroad provide the steam. Prior to shipment by the Oliver Iron Mining Co., another U. S. Steel subsidiary, the ore was treated at the mines with calcium chloride to retard freezing.

Air Forces Plan Largest Wind Tunnel to Test Full Size Aircraft and Missiles

The U. S. Air Forces has ordered $20,000,000 worth of electrical equipment from Westinghouse Electric Corp., for a new wind tunnel to test full size jet engines, guided missiles, and wing sections and fuselages of aircraft.

The wind tunnel will be built at the Arnold Engineering Development Center, Tullahoma, Tenn. The center houses important aeronautical research facilities, available not only to the Air Forces, Army, and Navy, but also to all parties—in government, industry, and science—interested in aircraft development. It was renamed recently in honor of the late Gen. H. H. "Hap" Arnold, wartime head of the Air Force.

Of four big electric motors to be built for the new tunnel, two will be the most powerful in the world, exceeding the 65,000-hp rating of those now in service at Grand Coulee Dam. The motors and switchgear for their control will be built by Westinghouse at East Pittsburgh.

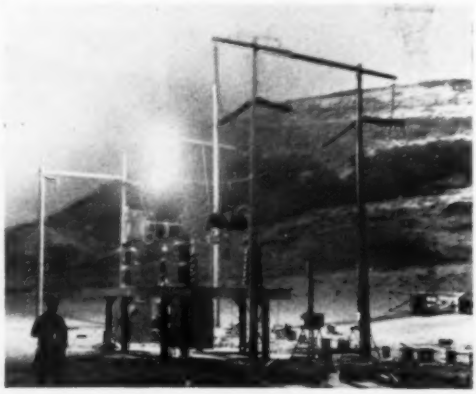
The Sunnyvale, Calif., plant will make the big compressor used to push air through the tunnel at speeds up to and above the speed of sound. The compressor will be the world's largest rotating machine. Details of the compressor, as well as the electric motors, are withheld pending completion of the project.

New Record Set for Short-Circuit Current In Switchgear Tests at Grand Coulee Project

A new record for short-circuit current was set recently during a series of tests conducted by the General Electric Co. and the U. S. Bureau of Reclamation at Grand Coulee Dam. The tests were made on a single pole unit of one of the thirteen 10,000,000-kva, 230-kv low-oil-content impulse type oil circuit breakers now installed at Grand Coulee. The generating capacity of twelve of the fourteen 108,000-kw generators plus the available capacity of other stations of the Northwest Power Pool were thrown into the tests to produce the largest value of short-circuit current ever recorded—the equivalent of 12,000,000 kva symmetrical three phase.

V. L. Cox, manager of engineering of General Electric's Switchgear Divisions, reports that this enormous amount of short circuit current was interrupted by the 10,000,000-kva circuit breaker unit within its rated interrupting time of three cycles without any sign of distress.

A total of twelve interrupting and 24 line dropping tests were made, all of which were entirely successful, according to Mr. Cox. The interrupting tests ranged from 5,000,000 to 12,000,000 kva and four of them, ranging from 6,000,



BETTER THAN CLIMBING IN AND OUT OF WINDOWS

Window washing at Caterpillar Tractor Co. is like child's play with the boom crane and crow's nest to help get job done. Boom cranes are also used for maintenance of fluorescent fixtures in fabrication and diesel engine factories

000 to 9,000,000 kva were high speed reclosing tests with reclosing times between 8.75 and 9.2 cycles. The line dropping tests were made with from 100 to 300 miles of 230-kv transmission line.

ALCOA Reactivates Standby Facilities to Stockpile Strategic Aluminum Supplies

The first pig of national defense aluminum to be produced by reactivated facilities of Aluminum Company of America at Badin, N. C., was presented to General Services Administrator Jess Larson five days after expansion negotiations had been completed with his office.

Earmarked for the nation's stockpile of strategic materials, the metal is the first of an additional 158,000,000 pounds to be produced annually by ALCOA-owned stand-by facilities at Badin, N. C. and at Massena, N. Y. The extra equipment is not economical to operate because large amounts of low-cost power are not available in these areas.

Separate from this "quick action" program is an ALCOA expansion plan calling for the construction of permanent new capacity capable of producing additional metal at the rate of 240,000,000 pounds per year. This plan involves enlarging ALCOA's Point Comfort, Tex., smelting facilities and construction of a new aluminum reduction plant at a site still to be selected.

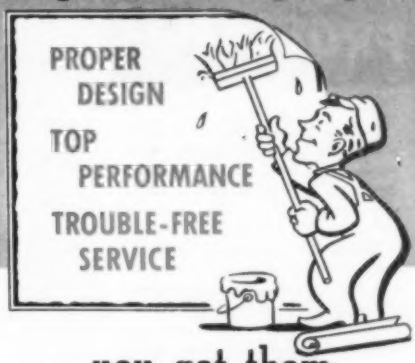
Industry Developing Low-Grade Phosphate Deposit in Missouri Basin

A mineral deposit, formerly considered too low-grade for practical commercial use will be developed in the Missouri Basin by the Victor Chemical Works of Chicago, through hydroelectric power supplied by the U. S. Department of the Interior from the Bonneville Power Administration.

Manufacturers of numerous essential chemicals, Victor

(Continued on page 112)

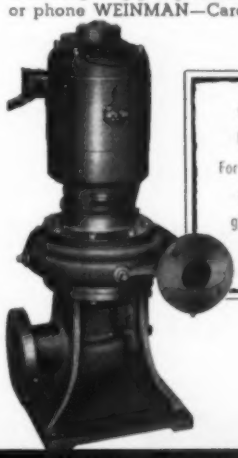
What you should expect from a pump



...you get them ALL from WEINMAN

Your WEINMAN representative is the man to talk to about your pumping requirements. He knows pumps—from "wire to water." He knows about their application, installation and maintenance. He is backed up by an organization where every department head has had at least twenty-five years' experience with ONE product—Centrifugal Pumps.

He will show you how proper design, top performance and years of trouble-free pumping service can reduce your operating costs. For a non-obligating pump consultation, just write, wire or phone WEINMAN—Career Men in Pumps.



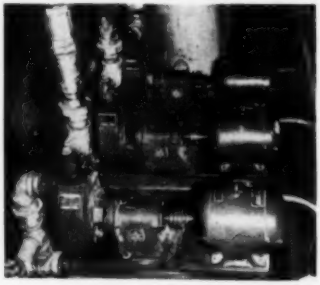
WEINMAN Type "U" Non-Clogging Pumps
For liquids carrying solids.
Capacities from 100 g.p.m. to 2,300 g.p.m.
Heads to 105 feet.

Built by Centrifugal Specialists
The WEINMAN Pump Mfg. Co.
286 Spruce Street • Columbus 8 • Ohio

DIFFICULT PUMPING PROBLEMS?

Are you having problems handling high suction lifts? Troubles with volatile liquids or liquids containing abrasives? Difficulties handling sludges or liquids thick with solids?

Ask Marlow engineers for recommendations. Marlow specializes in manufacturing pumps which solve some of industry's most perplexing pumping problems. Marlow self-priming centrifugal and Marlow sludge pumps are exceptional in their capability to make formerly difficult tasks easy.



EXAMPLE — A large New York plant required pumps which would handle vaporous solvent efficiently — without the severe wear and high maintenance costs of other pumps. Marlow self-priming centrifugals provided the ideal answer.

Engineering Department,
Marlow Pumps, Ridgewood, N. J.

☐ Please send me literature on Marlow pumps.

☐ I attach description of a current pumping problem. Please make recommendations without obligation.

Name .....

Company .....

Street .....

City ..... State .....

MARLOW PUMPS

Leading Manufacturer of
Self-Priming Centrifugal and Sludge Pumps

515 Greenwood Ave. Ridgewood, N. J.

MEETINGS and EXHIBITIONS

Highlights of coming meetings that will aid executives and engineers in planning itineraries. For additional information, please write sponsors of meetings

FEBRUARY

Industrial Waste Conference—The program for this sixth annual conference, to be held at Purdue University on February 21, 22, and 23, 1951, will cover developments in waste disposal and utilization. Don E. Bloodgood, chairman, Purdue Industrial Waste Conference, University, Lafayette, Ind.

MARCH

1951 Conference and Exhibition of National Association of Corrosion Engineers will be held at the Statler Hotel, New York City, March 13, 14, 15, and 16. 1951 General Conference Committee, Box 6120, Philadelphia 15, Pa.

APRIL

Materials Handling Exposition will feature new developments in outdoor materials handling at the International Amphitheatre, Chicago, April 30-May 4. Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

The British Industries Fair will be held April 30 through May 11. Heavy industry will be centered in Birmingham (England) and other trades will be on display in London. British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

Midwest Power Conference—The fourteenth annual conference will be held April 4, 5, and 6 at the Sherman Hotel in Chicago. The annual three-day meeting is sponsored by the Illinois Institute of Technology and 18 mid-western universities, aided by a ten-man industry committee.

MAY

Third World Petroleum Congress will be held at The Hague-Scheveningen (Holland) from May 28 to June 6, 1951. For more information or copies of papers, write Office of Secretary, USA National Committee, K. G. Mackenzie, 135 East 42nd St., c/o The Texas Co., New York 17, N. Y.

JUNE

International Commission on Illumination will hold an annual session June 25 to July 4, 1951 in Stockholm, Sweden. New offices of the I.C.I. have been opened at 570 Lexington Ave., New York, N. Y., under direction of Secretary General R. J. Whitney.

REVIEWS of RECENT BOOKS . . .

The latest books, read by the Plant Engineering Group, are reviewed here for your convenience. Write directly to the publisher for those in which you are interested

Sabotage

"Sabotage-How to Guard Against It," reprint of manual of the same name by Harry D. Farren. Published by National Foremen's Institute, Inc., New London, Conn. 12 pages. Price 25 cents single copy, quantity discounts available.

This booklet is designed for company distribution to employees. The author Harry D. Farren, is a well-known authority on sabotage and since publication of his original manual in 1940, over three million copies in all editions have been sold.

Transformers

"Instrument Transformers, Operation Principles and Application Information," manual published by the Meter and Instrument Divisions, General Electric Co., West Lynn, Mass. (GET-97A). Illustrated. 76 pages. Price $1.00, Apparatus Department, G. E., Schenectady 5, N. Y.

Written for practicing engineers and students engaged in the fields of power generation, transmission, and application where metering and relaying problems can be solved by the correct application of instrument transformers, the manual covers the basic fundamentals of instrument transformers, such as accuracy standards, insulation, and polarity. In addition, it gives complete information on potential and current transformers, including operating principles, types and ratings, applications, circuits, fusing, etc. A chart for selecting the proper transformers for a specific application and a bibliography covering various phases of instrument transformer operation, design, application and performance are included.

Lighting

"First Interim Report—Night-Work Lighting Systems for Construction Equipment," PB99480, published by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Illustrated. 142 pages. $3.75 per copy (orders should be accompanied by check or money order payable to the Treasurer of the United States).

Prepared by the Army Corps of Engineers, this detailed report on night-

work lighting systems for construction equipment deals with experimental work which is said to have made possible construction operations at 85% of normal daytime rate. Lighting systems, powered from a vehicle's regular generator, or from additional generating units provided, were placed on various mobile construction devices. Advantages of placing lighting equipment directly on construction units, rather than using area floodlighting, are said to include high intensity illumination on the work plane, elimination of shadows from the operator's position, ability to adjust lighting fixtures as needed, ability to operate individual equipment independent of general illumination, and elimination of dependence on heavy, cumbersome fixed lighting facilities.

Equipment developed in the tests is based almost entirely on standard commercial or military components, and is estimated to cost from $5 to $300 per vehicle, averaging slightly above $200.

Power Plant

"Steam Plant Operation," by Everett B. Woodruff, maintenance engineer, The Drackett Co., and H. B. Lammers, chairman and director of engineering, Coal Producers Committee for Smoke Abatement. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 544 pages. Illustrated. Price $7.00

The second edition of this book (first published in 1935) has been materially revised to include the radical changes and developments which have occurred in this field in the past 15 years. The new edition brings both the description of equipment and the technique of operation up to present day standards.

In line with today's high fuel costs, the authors have stressed efficiency of combustion and control of combustion processes. The book emphasizes plant operation and maintenance, explaining and solving practical plant problems, without the use of advanced mathematics. The rules and laws of power plant practice are stated and explained in the book, approved methods of operating equipment are outlined in detail, and rules of procedure to be followed to insure efficient operation are given in a step by step discussion.

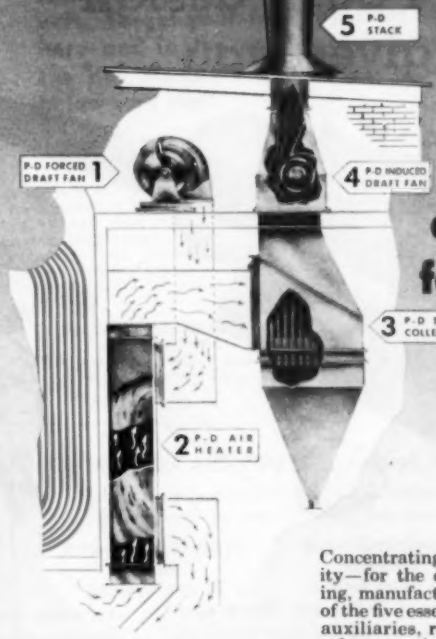
Mica

"Mica and Mica Substitutes—Attendance and Transcript of Proceedings," PB 101 142, published by the Office of Technical Services, Department of Commerce. 45 pages. Price 50 cents per copy. Orders should be addressed to the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. and should be accompanied by a check or money order payable to the Treasurer of the United States.

This is the report of an industry-military round-table discussion, held earlier this year under a cooperative arrangement between the Department of Navy and the National Security Industrial Association. Subjects covered include solid state synthetic mica, World War II mica research, miniature capacitors, cellulose esters, glass and vitreous enamel insulating materials, dimensionally stable ceramics, use of block talc, integrated mica, and new uses for mica.

UNIT RESPONSIBILITY

. . . from one source pd



the 5 essentials for handling the air-gas stream

Concentrating the responsibility—for the design, engineering, manufacture and delivery of the five essential boiler plant auxiliaries, relieves the consultant engineer and general contractor of this problem.

The Thermix Corporation, project engineers for Prat-Daniel equipment are glad to offer you their wide background in the proper application of (1) P-D Forced Draft Fans; (2) P-D Air Heaters; (3) P-D Tubular Dust Collectors (standard Valmont and Decantation); (4) P-D Induced Draft Fans; (5) P-D Fan Stacks.

Your over-all plan is simplified when the complete responsibility for the production and control of gas is placed with P-D, a firm known to the Utility and Power fields for over a quarter of a century. This unit responsibility means less details for you.

Why not let Thermix show you how you can save time and effort by specifying P-D equipment. Write today for the latest catalogs.

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HOW SUPERIOR'S 4-pass design gives you . . .

Taper Tube EFFICIENCY

The long-lived efficiency of Superior Steam Generators results from fundamentals of design which are basically sound. Superior's 4-pass, down-draft design provides a minimum of 5 sq. ft. of heating surface for each unit of horsepower rating; **and every inch of that heating surface is effective.**

WHY 4-PASS?

Theoretically (from the standpoint of heat transfer alone) the fire passes of a perfectly designed fire tube boiler would resemble a long, very gradually tapered cone surrounded by water. The large end would be sized in ratio to the volume and speed of the combustion gases so that the gases would be crowded into the tube and thus "scrub" the walls of the tube, forcing contact between fire and tube surface. As the gases give up their heat to the surrounding water (by transfer through the tube) the gases shrink in volume. The gradual taper of the tube compensates for this shrinkage, maintaining the scrubbing action which promotes efficient heat transfer.

Such a fire tube is impractical; but Superior's 4-pass design achieves the same effect. Its 4 passes are so designed that each successive pass has a lesser number of tubes (and hence a smaller area in cross section) for the passage of combustion gases. This is, in effect, **taper-tube** performance which results in the maximum practical efficiency of heat transfer . . . performance which makes it possible for Superior to guarantee **more** than 80% thermal efficiency **under field operating conditions.**

Superior Steam Generators are completely factory assembled, backed by undivided responsibility. Burn gas or oil, or both. Manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up 250 p.s.i. or for hot water.

Write today for the details in Catalog 202.

Superior Combustion Industries, inc.

Factory Emmaus, Pa.
Executive Offices Times Tower, Times Square, New York 18, N. Y.

readers' guide to advertised products

Here you'll find, briefly reviewed, all the booklets and leaflets offered in the advertising columns of this issue of INDUSTRY AND POWER. For easy reference, this listing is divided into various classifications of products. To get your free copies of literature described here and in the corresponding advertisements, list the Key Numbers of the paragraphs on the cards below and mail.

AIR & DUST FILTERS & COLLECTORS

1—See page 97. Dust & Fume Control Systems: Kirk & Blum experts can design and install a complete dust or fume control system for your plant that will solve your problems. Write for booklet. Kirk & Blum Mfg. Company.

2—See page 105. Fly Ash Collector: "LR" Fly Ash Collector designed especially for small boilers—collects 99% of all 100-mesh cinder discharge. Fits small plant's boiler room. No cleaning, no water. Write for complete facts. Buell Engineering Company.

ANTI-CORROSIVE & PROTECTIVE COATINGS

3—See page 9. Rust Preventive: Rust-Oleum seals metal so that no rust-causing oxygen can reach it. Available in a full range of colors. Write for complete catalog. Rust-Oleum Corporation.

BOILERS & BOILER ACCESSORIES

4—See page 100. Low Cost Steam: Data describes a boiler available in 6 sizes—6 to 36 hp. Economical to buy and operate. 6" scale with pipe diameter markings also sent upon request. Kewanee Boiler Corp.

5—See page 7. Keystone Generator: 2-drum water tube boiler, automatic oil and gas burner, induced draft fan, operating and safety controls. Easily cleaned—nationally serviced. Write for Bulletin SB-38. Erie City Iron Works.

6—See pages 32, 33. Steam Generating Units: Select Riley equipment for efficient, trouble-free performance that cuts operating costs to minimum. Write today for further information. Riley Stoker Corporation.

7—See page 50. Vogt Products: Write today for further data on Vogt boilers, process equipment, chemical equipment, refrigeration equipment, valves and fittings. Henry Vogt Machine Co.

8—See page 119. Steam Generators: Wickes can fill your exact requirements for boilers of any type up to 250,000 lbs. steam per hour and 850 psi. Write for descriptive literature on the famous Wickes line of steam generators. The Wickes Boiler Co.

9—See page 118. Preferred Unit Steam Generator: Check the important features of Preferred Unit Steam Generators that assure efficient economical service for an average of 25 years. Write for details. Preferred Utilities Mfg. Corp.

BUILDING HEATING, VENTILATING & AIR CONDITIONING

10—See page 17. Radiant Heaters: Uniform, exact heat when you want it is yours at the turn of a dial when you use Chromalox Electric Radiant Heaters as your heat source for infrared drying, preheating, baking, curing, dehydrating and similar applications. Write for application file on Chromalox Radiant Heaters. Edwin L. Wiegand Company.

BUILDING MATERIALS & MAINTENANCE

11—See page 114. Free Repair Handbook: 40 pages describing Smooth-On repairs that can save you time and money. 170 illustrations. Write for your free copy now. Smooth-On Mfg. Co.

12—See page 102. Pipe Joint Sealing Compound: Pipe joints and fittings sealed with Key sealing compounds do not leak. Connections will not freeze and reopening is easy. Send for free sample. Key Company.

13—See page 102. Floor Resurfacer: You can resurface or patch broken concrete floors with tough "Ruggedwear" resurfacer. Makes durable patch or

To: INDUSTRY AND POWER, St. Joseph, Michigan **February, 1951**

Please have forwarded to me, at no obligation, the literature I've indicated by the following Key Numbers and Letters:

Advertised Products Numbers begins Page 85	*New Equipment Numbers begins Page 10*	*New Bulletin Letters begins Page 20*

Your Name_____ **Title**_____

Your Company_____

Co. Address (St. & No.)_____

City_____ **State**_____

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reader's guide to advertised products

complete overlay. Simple to install, no chopping or chipping required. Use indoors or out. Quick dry. Send coupon or write for complete Handbook of Building Maintenance. Flexrock Company.

14—See page 110. Check This Economy Move: Over 1900 firms supply more than 33,000 products which Hajoca stocks for industry. Use this one source and eliminate your high cost of dealing with many sources of supply for the industrial products you use. Hajoca Corp.

COAL ASH & BULK HANDING

15—See page 115. Hydraulic Ash-Handling System: Write today for your copy of the new Beaumont brochure: "Answers to Your Ash-Handling Questions". Contains expert recommendations on all types of ash-handling systems. Beaumont Birch Company.

16—See page 99. Hewitt-Robins Vibra-Veyor: Up to 200 ft of pan length on one vibrator. Moves anything you can handle with a belt conveyor. Easily installed, saves on power. Get the whole story by writing for Bulletin 135. Robins Conveyors Division, Hewitt, Robins Incorporated.

CONTROLS & REGULATORS

17—See page 110. Automatic Liquid Measuring Gages: Write for complete details on liquid level gages for measuring liquids of all kinds. Dial readings in feet, inches, gallons, pounds or any desired units. The Liquidometer Corp.

18—See page 102. Temperature Regulators: Write for Stacon Bulletin 50-1000 for full details on extra sensitive, accurate, economical temperature regulators. Farris Stacon Corporation.

19—See page 111. Boiler Feed Regulators: Write for complete details on the Henszey line of boiler water level controls, made for pressures up to 600 lbs. and in sizes up to 4 inches. Henszey Co.

20—See page 40. Pressure and Temperature Regulators: Write for Bulletin 350. Spence gives full data on Spence Regulators. They operate at low unit stress for long life, cut down maintenance cost. Spence Engineering Company, Inc.

21—See page 114. Regulators and Thermometers: Bulletins 500 and 1000 give you full data on regulators and thermometers that will cut your processing cost to a new low. H. O. Trerice Co.

22—See page 113. Automatic Controls: Write for Catalog for information and data on this complete line of automatic controls for heating, air conditioning, refrigeration and various industrial applications. Mercoid Corp.

23—See page 100. Pneumatic Temperature and Humidity Control: Constant temperature and humidity conditions in each room can be maintained at any predetermined point with a POWERS system of pneumatic control. Ask for a Powers engineer to study your requirements. No obligation. The Powers Regulator Co.

ELECTRICAL DISTRIBUTION

24—See page 91. Magnetic Starters: Write today for folder on Arrow-Hart RA magnetic starters. High arc resistance, ease of wire and servicing, balanced mechanism cuts space in half. The Arrow-Hart & Hegeman Electric Company.

ENGINES

25—See page 95. Stationary Engines: If your plans call for new or replacement tower, check Cooper-Bessemer first. You have a choice of oil, gas-diesel or full- gas operation, atmosphere or supercharged, whichever is to your greatest advantage. Write for more complete data. The Cooper-Bessemer Corporation.

FANS AND BLOWERS

26—See page 2. Fans and Blowers: Hartzell systems remain trouble-free year after year; keep operating costs at minimum. Send coupon for free information or free consultation with Hartzell field representative. Hartzell Propeller Fan Co.

27—See page 109. Mechanical Draft Fans: Years of experience make Green an authority as a manufacturer of high-efficiency, low-operating cost draft fans. Write for Mechanical Draft Fan Bulletin 168 today. The Green Fuel Economizer Co.

FUELS & FIRING EQUIPMENT

28—See page 8. Gas and Oil Burners: This company manufactures burners for every heating and power need—combination gas and oil burners, for either vertical or horizontal firing. Write today for free literature. John Zink Company.

(Continued on page 88)

Use these postage-free cards to order booklets and catalogs from advertisers, new bulletins and new equipment literature. List key numbers or letters of the paragraphs describing the items you want in the spaces provided on cards.

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Please have forwarded to me, at no obligation, the literature I've indicated by the following Key Numbers and Letters:

Advertised Products Numbers begins Page 85	*New Equipment Numbers begins Page 10*	*New Bulletin Letters begins Page 20*

Your Name_____ **Title**_____

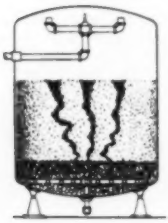
Your Company_____

Co. Address (St. & No.)_____

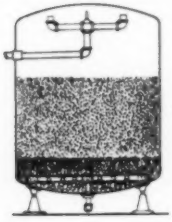
City_____ **State**_____

Is your water softener operating in the HIGH COST zone?

Check for zeolite loss



Check for packed and channelled zeolite



Check for worn out zeolite

Here's an easy way to find out

Far too many zeolite water softeners in use today are operating in the high cost zone—without it being known. How about your softener? Is it delivering less soft water than it did when new? Does it require more frequent regeneration with greater salt consumption? If so, it is operating in the high cost zone and you are not getting full value from your investment.

LOSS OF ZEOLITE can cause a big drop in soft water output.

PACKING AND CHANNELING will greatly reduce water softening capacity, cause hard water to leak through the softener and damage the zeolite.

WORN OUT OR DAMAGED ZEOLITE can also cause a big reduction in soft water gallonage.

Any of these troubles necessitate more frequent regeneration with greater salt consumption.

How to make your water softener perform like new

Any lost zeolite should be replaced with new at once. Damaged or worn out zeolite should be completely replaced. Packing and channeling can be remedied by loosening up the zeolite and providing the backwash rate required to properly cleanse and agitate the zeolite so that packing will not recur.

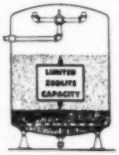
Your Elgin representative will be glad to check your softener and show you how to make it perform like new. With all types of zeolite to choose from, he can provide the kind you need. Whatever the type, you may be sure it will give maximum capacity and years of efficient service.

How to make it deliver up to 10 times more soft water

If your softener uses one of the older type zeolites of low softening capacity, you can switch to one of the amazing new Elgin high capacity types. In this way, it may be possible to get as much as 10 times more soft water from your softener. But even if the zeolite in your softener is entirely satisfactory, we can increase its capacity as much as 44% and prevent future costly zeolite loss. The ingenious Elgin Double Check type manifold, adaptable to any make of water softener, makes this possible. It permits the use of a deeper zeolite bed in your present softener which provides the added softening capacity as diagrammed below. Your Elgin representative can show you how this manifold arrangement can be installed at low cost in your water softener.

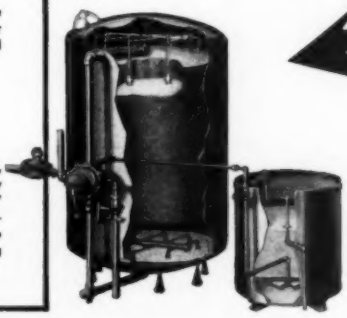
ELGIN SOFTENER CORPORATION, 138 N. Grove Avenue, Elgin, Illinois

WRITE US TODAY for full particulars



Shallow zeolite bed of ordinary water softener gives limited softening capacity.

Deep zeolite bed, made possible by Elgin "Double Check" Manifold arrangement, gives up to 44% more softening capacity.



ELGIN
Economical
WATER CONDITIONING
FOR EVERY NEED

ELGIN WATER SOFTENER

Gives Up to 44% More Soft Water

Where new equipment is required, the advanced Elgin "Double Check" Water Softener is your best buy. Compared with others it delivers up to 44% more soft water; prevents costly zeolite loss; costs less to buy and operate. Ask for Bulletin 610.

readers' guide to advertised products

(Continued from page 86)

29—See page 27. Fanmix Gas and Oil Burners: Use coupon in this advertisement to get complete data on Coppus-Dennis Fanmix burners that allow you to get more heat release per cu. ft. of furnace volume. Coppus Engineering Corp.

HEAT EXCHANGER EQUIPMENT

30—See page 94. Quintair Heat Exchanger: Type E gives you low cost, efficient cooling or condensing of liquids, gases or vapors. Full details are contained in free Bulletin No. 11.0.080. Write today. J. F. Pritchard & Co.

31—See page 50. Vogt Products: Write today for further data on Vogt boilers, process equipment, chemical equipment, refrigeration equipment, valves and fittings. Henry Vogt Machine Co.

32—See page 113. Instantaneous Water Heaters: Engineered for all industrial needs. Provides hot water instantly at the temperature required in the volume needed. Write for complete engineering details and specifications. Pick Manufacturing Co.

INSTRUMENTS FOR MEASURE OF ELECTRICITY

33—See page 98. All-Metal Thermometers: Write for complete data on these easy-to-read, ruggedly constructed thermometers for most industrial applications. Wide variety of types. Weston Electrical Instrument Corporation.

LUBRICANTS, LUBRICATION, OIL FILTERS & PURIFIERS

34—See page 108. Lubriplate: Write today for authentic information on how these lubricants effect maximum savings even in unusually severe lubrication problems. Fiske Brothers Refining Company, Lubriplate Division.

35—See pages 22, 23. Lubricants: Greases and oils "job proved" to stand up under heavy-duty operation. Learn how you can keep your equipment operating steadily and safely, with minimum time-out for maintenance. Write for full information. Sun Oil Co.

36—See pages 48, 49. Steam Cylinder Oils: No matter what your operating conditions, there is a Sinclair Steam Cylinder Oil made expressly to give the utmost in lubrication satisfaction. For lubrication counsel see your nearest supplier of Sinclair products, or write Sinclair Refining Company.

37—See page 116. Non-Fluid Oil: Send for instructive bulletin and free testing sample of Non-Fluid Oil for positive bearing protection. New York & New Jersey Lubricant Company.

38—See pages 35, 36. Industrial Oils: Stanoil Industrial Oils have proved their ability to handle a variety of jobs in hydraulic systems, compressors, and reduction gears. Check with your nearest local Standard Oil office and let their lubrication specialist give you the facts on Standard HD Diesel Oil, too. Or write for additional data. Standard Oil Company (Indiana).

MAGNETIC SEPARATORS

39—See page 39. Do You Have a Contamination Or A Separation Problem: Look on page 39 for successful solutions to a variety of contamination and separation problems. Note the coupon at the bottom of this advertisement which offers you free literature. Eriez Manufacturing Company.

MECHANICAL POWER TRANSMISSION

40—See page 104. Gear Type Couplings: For trouble-free coupling service write for full catalog on Waldron gear type couplings. Solid cover sleeve, non-welded—no metal-to-metal wear—hermetically sealed. John Waldron Corporation.

41—See page 3. V-Belt: Ask your nearest distributor of Goodyear Industrial Rubber Products for full details on V-belts "tailored" to your drive requirements for lower V-belt costs. Or write to Goodyear for complete information. Goodyear Tire & Rubber Co.

42—See page 28. Roller Bearings: You will find it to your advantage to buy a Hyatt-equipped machine, because Hyatt Roller Bearings help machines to live longer with a minimum of maintenance and lubrication. Hyatt Bearings Division, General Motors Corporation.

43—See page 25. Condor Compensated Belt: Longer life and trouble-free service are assured as Compensation prevents outer ply ruptures, fastener troubles, and ply separation. Write for Bulletin 6808J, which explains these and other features. Raybestos-Manhattan, Inc.

PACKAGED STEAM GENERATORS

44—See page 84. Packaged Steam Generators: New, fully illustrated Catalog 202 gives complete details for units available in 17 sizes. Write today. Superior Combustion Industries, Inc.

45—See page 108. Packaged Steam Boilers: Write for catalog with full information on complete line of packaged steam boilers—fully automatic, 60 to 500 hp plus ample overload. Johnston Brothers, Inc.

46—See page 110. Packaged Steam Generators: Write for Catalog IP251 for tested data to show how you can reduce your steam costs with a Dutton "Packaged" Steam Generator. Hapman-Dutton Company, Dutton Boiler Division.

PACKING & GASKETS

47—See page 89. Piston Packing: Pumcups cut downtime and material and maintenance costs to minimum, hold volumetric efficiency constant. Write for free bulletins No. 4401 and 4502. Darling Valve & Mfg. Co.

48—See page 31. Navalon Packings: Made of "ramie", these packings give service against fresh or salt water, brine, cold oil, and for use on pumps, elevators, etc. Write for folder PK-32A. Johns-Manville.

For your free copies of this new literature and more data on advertised products, list the key numbers of the descriptive paragraphs on one of the handy order cards, page 85. Mail today—postage-free!

PIPE AND FITTINGS

49—See pages 78, 79. Gun-Pakt Expansion Joints: Send for free Bulletin EJ-1912 for the full story on Yarway Expansion Joints. Insert a plug of packing, turn a wrench, the joint's tight and all under full steam pressure. Write today. Yarnall-Waring Company.

50—See page 46. Flexible Metal Tubing and Metal Hose: Write for literature describing the many uses and types for handling steam, water, oil, solutions, semi-solids, or gases. American Metal Hose Branch, The American Brass Company.

51—See page 101. Pipe Unions: Bronze-to-bronze ball joints insure long life and tight joints. Because of precision in manufacture these unions can be disconnected and reinstalled many times. Send for complete information today. E. M. Dart Mfg. Co.

52—See page 42. Expansion Joints: Copper and stainless steel expansion joints to solve problems of expansion, vibration, and misalignment in pipe lines. Chicago Metal Hose Corporation.

53—See page 21. Welding Fittings Catalog: Send for this catalog containing full data on the complete line of Grinnell carbon steel butt welding fittings and forged steel flanges. Grinnell Company, Inc.

54—See page 90. Pre-fabricated piping: One, convenient source for any industrial requirement in piping. Write for data on this complete service. Albert Pipe Supply Co., Inc.

PUMPS

55—See page 81. Centrifugal Pumps: Weinman pumps work at maximum efficiency on every job efficiently, dependably, economically. Write for full information. The Weinman Pump Mfg. Co.

56—See page 51. Centrifugal Pumps: Write for latest Bulletin on Worthington Centrifugal Pumps. More than 10,000 standard combinations of capacities, heads, casings and mountings insure the right pump for you. Worthington Pump and Machinery Corp., Pump and Compressor Merchandising Div.

57—See page 82. Difficult Pump Problems: Marlow specializes in manufacturing pumps which solved some of industrys's most perplexing pumping problems. Use the coupon on page 82 for literature on these pumps. Marlow Pumps.

58—See page 114. New Condensed Pump Catalog: Write for your copy of the condensed Catalog "M". Aurora invites your special pump problems which will be handled efficiently by personnel devoted exclusively to pump design and manufacture. Aurora Pump Company.

REFRACTORIES

59—See page 94. Refractory Cement: Bulletin describes Super 3000 Refractory that protects inside insulation of metal ducts, flues and breechings with maximum efficiency. Write today. Refractory & Insulation Corp.

STEAM SPECIALTIES

60—See page 41. Yarway Steam Traps: Maintain even temperatures because they continually sample and respond to a trickle of the condensate. Write today

(Continued on page 90)

It's Easy TO CHANGE TO DARCOVA

THE ORIGINAL COMPOSITION CUP

MOST engineers and operators in charge of reciprocating pumps are aware that Darcova Pumcups offer distinct advantages over piston packing of other types—that Pumcups last 5, 10, or even 100 times as long, that fluid slippage is all but eliminated, that efficiency doesn't decrease with Pumcup wear, that pump speed can be reduced and volume increased, that power is saved, and that downtime and maintenance expense are cut to a fraction.

But what many of these men are not aware of is the downright simplicity of changing over to Darcova Pumcups. It's easier than replacing with the old type packing.

To simplify the change-over, to prolong liner and pump life, Darling Pistons are recommended. They are carried in stock at all times, can be supplied in various metals and alloys for every industrial need.

For a free bulletin containing complete information, write, or use the coupon below.

Darling Valve & Mfg. Co., Williamsport 9, Pa.
Please send me the free bulletin checked below:
☐ No. 4401 Darcova Pumcups for reciprocating pumps.
☐ No. 4502 Darcova Pumcups for air or hydraulic mechanisms.

Name_____
Company_____
Address_____
City_____ State_____

DARCOVA
THE ORIGINAL COMPOSITION CUP

DARLING VALVE & Manufacturing Co.
WILLIAMSPORT, PA.

readers' guide to advertised products

(Continued from page 88)

for full information on Yarway Impulse Steam Traps. Yarnall-Waring Company.

61—See page 120. Steam Traps: Super-Silvertops save you money in two ways—cut down installation costs and keep operating costs low. Write for helpful book, "Solving Steam Trap Problems." The V. D. Anderson Company.

62—See page 102. Thermostatic Traps: For trapping instrument sterilizers, water stills, coffee urns, warming tables and similar equipment—use Illinois. Write for free literature. Illinois Engineering Co.

63—See page 52. Sarco Steam Trap: Write for your free copy of Catalogs No. 250 and 550, containing complete data on Sarco No. 87 Trap for bulk station tanks, ducks and piers, instrument cabinets, outdoor steam equipment, pipe line heaters, tankers and tugs, tracer lines. Sarco Company, Inc.

64—See page 112. Small Trap Catalog: Write today for the new Strong Trap Catalog 68-J. Includes complete data on the No. 070 trap available for pressures from 0 to 150 psi. Strong, Carlisle & Hammond Company.

TOOLS

65—See page 108. Combination Blower-Suction Cleaner: It's a snap to rid all of your equipment of damaging dirt, dust, and grit with this portable cleaning tool. Write for more data. Clements Mfg. Co.

66—See page 111. Valve and Bibb Reseater: Don't junk expensive globe and angle valves, bibbs, fixtures—reseat them with the Skinner Valve and Bibb Reseater. Easy to use. Pays for itself on first 2 or 3 jobs. Write for more information or order from M. B. Skinner Co.

67—See page 106. Small Tube Cleaners: With ROTOJET Junior Tube Cleaners you can clean tubes as small as .495" I. D. quickly and economically. No leakage. No stalling at low speeds. Send for ROTOJET Junior Bulletin. Elliott Company, Roto Division.

68—See page 13. Traction Dynamometers: Since 1835, John Chatillon & Sons have been world famous for the precision manufacture of force measuring devices which meet the most specific requirements of industry. Fill in and mail the coupon shown on page 13 for the complete brochures you need in your plant. John Chatillon & Sons.

69—See page 96. Tube Cleaning and Expanding: Write for sound advice and top service on your tube cleaning and tube expanding problems. Airetool products help you cut down time, give lower maintenance cost, more thorough scale removal. Airetool Manufacturing Company.

TURBINES

70—See page 38. Terry Turbines: There is no obligation for a complete discussion of your specific requirements with any Terry Turbine District Representative. Also, send for Bulletin S-143 that gives full details. The Terry Steam Turbine Co.

71—See page 16. Auxiliary Turbines: Write for your free copy of Bulletin SW-50. Investigate the use of turbines as an alternate source of auxiliary drive. L. J. Wing Mfg. Co.

VALVES

72—See page 47. Check Valves: Chapman Tilting-Disc Check Valves practically eliminate pipe line stresses—head losses are reduced 65% to 80%. Write for complete description. The Chapman Valve Mfg. Co.

73—See page 111. Rockwell Valves: Feature hydraulic control for shut-off and throttling of air, gases, steam, liquids, semi-solids. Butterfly and slide types—any type manual or automatic control. Write for catalog. W. S. Rockwell Company.

74—See page 34. Welded Bonnet Univalves: Ask for Catalog 12-G6 describing these valves for service up to 2500 lb and 1000 F, as well as information on other Intex valves. Edward Valves, Inc.

75—See page 103. Valves: Outstanding design, sound engineering and rugged construction are built into every Fairbanks valve to meet all kinds of valve requirements in industry. Write for details. The Fairbanks Company.

76—See page 26. Check Valves: For increased flow capacity, for fast positive closure on back-flow, for easier servicing, get a demonstration of the 200 and 300-pound Y-Pattern Check Valves, free literature available on these valves upon request. Crane Co.

WATER TREATMENT

77—See page 108. Versene Test Kit: Lets you test the hardness of water in your plant in less than two minutes. Includes enough chemical to make more than 50 separate tests. Refills available. Full directions in each kit. Write today. Bersworth Chemical Company.

78—See page 6. Boiler Water Comparators: Low cost, extreme accuracy, simple operation make Taylor Comparators ideal instruments for all plants. Write for free booklet. W. A. Taylor and Co.

79—See page 11. Water Treatment System: Write today for complete information on the Nalco System of Water

For your free copies of this new literature and more data on advertised products, list the key numbers of the descriptive paragraphs on one of the handy order cards on page 85. Mail today—postage-free!

When You Call For Any Industrial Requirement In Piping

ALBERT

"Rings the Bell"

***SPEEDLAY PIPE SYSTEM*—completely packaged for fast-laying temporary and semi-permanent lines for water, compressed air and other services.**

PILING—Sheet Piling—light weight • Tubular—all sizes

PILE SHELLS—Spiral Welded, Hel-Cor, Riveted, CAISSONS

PILE FITTINGS—All types and sizes for steel and wood, cast steel and iron points. Plates and shoes cast steel and malleable iron sleeves.

CULVERTS—Corrugated, Spiral or Riveted Steel.

VALVES AND FITTINGS—Tube turns, Dresser, Vitaulic, cast iron or steel, forged steel, special alloys, water main.

SPECIALISTS IN PRE-FABRICATED PIPING

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PIPE SUPPLY CO., INC.
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Brooklyn 11, N. Y.
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readers' guide to advertised products

Treatment and how it can reduce your costs and increase effectiveness of water treatment in your plant. National Aluminate Corp.

80—See page 87. Water Softeners: Be sure to write today for facts on how you can modernize your present water softening system with Elgin Double-Check manifolds at maximum savings. Elgin Softener Corporation.

81—See page 113. Water Treating Equipment: Get your copy of fact-filled bulletins giving complete data on manual or automatic equipment in all sizes, types and capacities. Hungerford & Terry, Inc.

82—See page 4. Water Refining Equipment: Do you want the right answer to your water softening or demineralizing problem? Let Refinite send you specially prepared, pictorial literature that shows how Refinite helps get the "right answer". Refinite Corporation.

83—See page 29. Drew Water Treatment Service: Starts with the conditions that exist in your plant and includes all the corrective and preventive measures required for efficient operation. If you would like to cut costs, consult the Drew Engineer or write for information. E. F. Drew & Co., Inc.

84—See page 93. Water Conditioning System: Write for full facts concerning this system that gives you all the heating, chemical feeding and clarification facilities for optimum water conditioning results. Ask for Bulletin W-212-B5. Worthington Pump and Machinery Corp.

85—See page 100. Water Treatment: Write for detailed information about solving your water treatment problems. This complete service includes each step from original survey of problem to installation of water purification equipment. General Filter Co.

86—See page 107. Cuno Flo-Klean Filter: Makes raw water suitable for many plant services, keeps recirculated water clean, pays for itself in quick time. Write today or send coupon for full information. Cuno Engineering Corporation.

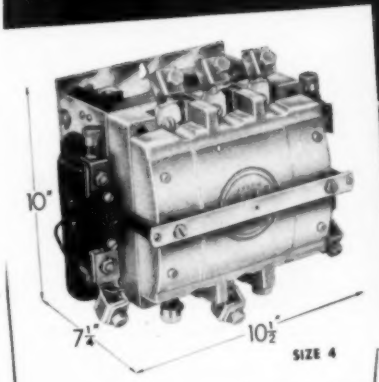
WELDING & CUTTING EQUIPMENT

87—See page 37. Purox Regulators: Experienced operators rely on Purox regulators to give them the exact pressure and volume of oxygen and acetylene needed to do a first class job. For jobber's name and free folder describing Purox apparatus, write today. Linde Air Products Co., a Div. of Union Carbide & Carbon Corp.

For your free copies of this new literature and more data on advertised products, list the key numbers of the descriptive paragraphs on one of the handy order cards on page 85. Mail today—postage-free!

CHANGE FOR THE BETTER!

WITH THE New ARROW AH HART TYPE "RA" MAGNETIC STARTERS

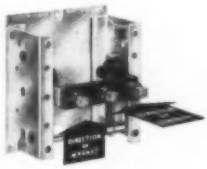


Starter alone: 3-3/4"x3-1/4"x3-3/8"
Enclosure: 6-11/16"x6-3/16"x3-5/8"

JUST ½ THE SPACE

Motor requirements change. Often the horsepower of operating units must be increased where space is at a minimum. This calls for Arrow-Hart "RA" Magnetic Starters, which occupy *just* ½ the space of conventional starters. Besides their revolutionary small size, A-H starters give you *straight-thru front wiring* for fast and easy servicing, and many other performance extras.

NEW "RA" MECHANISM



Best reason for replacing with Arrow-Hart! This exclusive right angle balanced mechanism does the work of a unit twice its size — and does it more dependably, for years longer! Note that magnet action is vertical, contacts meet horizontally . . . that means finer balance, with positive action, in a smaller package. Add easy installation, more working room in the box, and easy-to-reach terminals and contacts, and you have some of the many reasons why nationally recognized manufacturers are replacing with Arrow-Hart. Here's how you can get *all* the details:

WRITE FOR LITERATURE

Write for the "RA" folder, which features complete information on the Arrow-Hart line of magnetic starters — available in local and remote control or selector switch types in all sizes. Send for this free booklet today.

THE ARROW-HART & HEGEMAN ELECTRIC CO.

ARROW·HART

1202 HAWTHORN ST., HARTFORD 6, CONN.

NEWS . . . of men and companies

Dravo Corp.—Appointment of Robert C. Black as advertising manager of the machinery div. was announced. He was on the staff of the v-p of Westinghouse Electric Corp. and had served as advertising and sales promotion manager for the southeastern district.

Westinghouse Electric Corp.—A new plant for the production of small electric motors in Union City, Ind. will be built. It will be a modern one-story structure containing both manufacturing and office space. When in full operation, the plant will employ approximately 500 men and woman. Production is expected to start late in 1951.

Link-Belt Co.—For better service in the Pittsburgh area, the company has constructed and is now operating a new factory branch store located at 5020 Centre Ave., Pittsburgh 13, Pa.

The South African subsidiary, Link-Belt Africa Limited, has purchased a 12,000 sq ft manufacturing plant in Springs, Transvaal, about 28 miles east of Johannesburg, for manufacturing conveyer machinery and other Link-Belt products commonly used in South Africa.

American Air Filter Co., Inc.—John M. Kane has been appointed manager of the Dust Control Div. He joined the company in 1933 and has been chief engineer of the division since 1944.

John M. Kane

C. G. Cooper

The Cooper-Bessemer Corp.—Charles G. Cooper, formerly manager of the Washington office has been elected vice-president, partially in recognition of his direction of the company's efforts in the national defense program. He is a grandson of Elias Cooper, one of the company's founders.

Goodyear Tire & Rubber Co.—Charles W. Howard, formerly affiliated with the International Harvester Motor Truck div. and more recently with Hupp Corp., has joined the rim sales staff as a field contact man.

The Lunkenheimer Co.—Paul M. Arnall has been elected president. He has been with the company one year, having previously been associated with the Ohio Injector Co. as executive v-p.

Owens-Illinois Glass Co., Kaylo Div.—A plan doubling output of hydrous calcium silicate, a light weight, fireproof and non-critical building and insulating material, at one plant and to modernize manufacturing techniques at another has been announced.

Weston Electrical Instrument Corp.—Arthur L. Morrison has been appointed purchasing agent to succeed George T. Deaney who was made war activities coordinator.

Borg-Warner Corp.—Paul J. Larsen, former director of the Office of Civil Defense of the National Security Resources Board, has been appointed assistant to Roy C. Ingersoll, president, it was announced.

Tube Turns, Inc.—The Bethlehem Supply Co. and the Bethlehem Supply Co. of Calif. have been appointed distributors of Tube-Turn welding fittings and flanges. The supply company is a subsidiary of the Bethlehem Steel Co.

(Continued on page 94)

GENERAL
REG. U.S. PAT. OFF.

RODA — High grade gas, by-product, steam and household stoker coal from Wise County, Virginia, on the Interstate Railroad.

DENDRON — High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

STONEGA — High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

PREMIX — A laboratory controlled product blended to meet exacting stoker requirements. From Wise County, Va., on the Interstate Railroad.

GLENBROOK — The Premium Kentucky High Splint unmatched for domestic use. Produced in Harlan County, Kentucky, on the L. & N. Railroad.

COKE — Roda and Stonega from Wise County, Va.

CRITERION COAL — High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

HAMPTON COAL — High volatile domestic, steam and by-product coal from Boone and Logan Counties, W. Va., on the Chesapeake & Ohio Ry.

CROZER — Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railway.

LYNCO — High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Virginian Ry.

ANTHRACITE — Hazle Brook—*Premium Lehigh* Raven Run—*Premium Mahanoy*

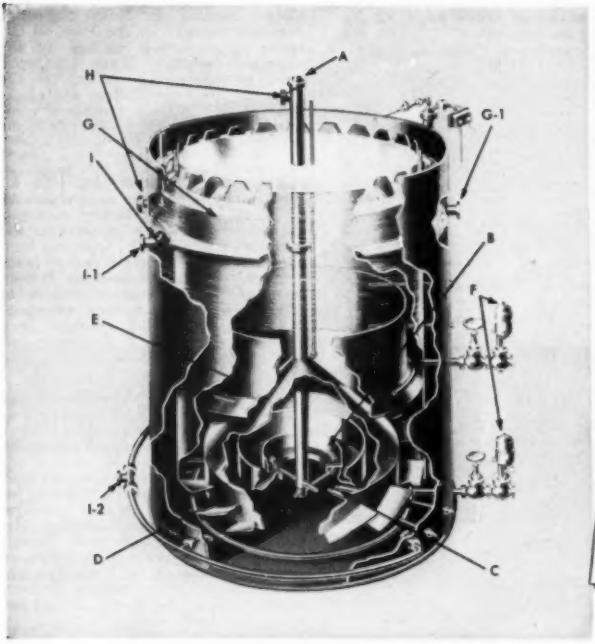
Capable engineering personnel and the experience gained through long and varied marketing activity assure proper application of one of the above brands and effective servicing of any fuel requirement.

General Coal Company

123 SOUTH BROAD STREET PHILADELPHIA 9, PA.

Branches:

BLUEFIELD, W. VA. BUFFALO CHARLOTTE, N. C. CINCINNATI
NEW YORK NORFOLK PITTSBURGH



Vortex mixing eliminates need for submerged moving parts in the Worthington Cold Process Slurry Type Precipitation Water Softener and Coagulator.

REACTION TANK of Worthington Slurry Type Softener (Slurry bed eliminated for clarity). (A) Raw water influent line. (B) Vortexor for optimum slurry production. (C) Chemical Applicators. (D) Slurry bed rotator. (E) Symmetrical Slurry concentrator. (F) Proportionate sludge removal. (G) Collector trough for treated water. (G-1) Treated water effluent. (H) Complementary recirculation. (I) Filter wash water compartment. (I-1) Filter wash water suction. (I-2) Filter wash water return.

This slurry bed stays put!

. . . and troublesome variables are out

These Features Give You The Uniformity You Want

WORTHINGTON SLURRY TYPE PRECIPITATING WATER SOFTENER AND COAGULATOR gives consistent, uniformly softened water

If it's clear, uniformly softened water you want, this unique Worthington Water Softener is just what you need. Concentrated quick mixing and rapid recirculation of applied chemicals and raw water, *achieved by hydraulic energy instead of submerged mechanical moving parts*, is an important, progressive development in the water treatment field.

New Bulletin W-212-B5 gives you 16 pages of vital facts about this unique cold process water softening method. Write for your free copy today.

REMEMBER . . .

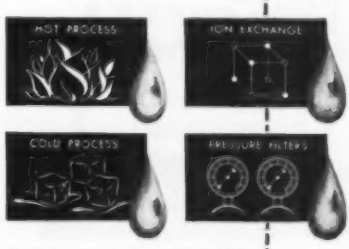
Worthington engineers *all four* water conditioning processes; therefore, can give you unbiased recommendations on which process is right for you . . . further proof that *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Water Treating Division, Harrison, N. J.*

JO.1

WORTHINGTON

WATER CONDITIONING

Worthington Makes More of the Equipment for All Types of Water Conditioning Systems



NEW

SUPER REFRACTORY for Severe Conditions

Resists Severe Erosive Action of Gases at All Temperatures to 3000° F.

Reduces Repair, Expense in Outage, Materials and Labor

- ✓ New or old fire brick linings bonded with R & I Super #3000.
- ✓ Cracks, spalls and broken sections of boilers or coke ovens—hot or cold patched with Super #3000.
- ✓ Interiors of induced draft housings eroded by high velocity fly ash—rebuilt with Super #3000, applied over expanded metal lath.
- ✓ Insulation of inside duct lining—plaster faced with Super #3000.

The greatly increased refractory life of these and other applications proves the remarkable ability of Super #3000 Refractory Cement to stand up under severe operating conditions at low temperatures as well as high temperatures up to 3000°F.

Super #3000 is easy to trowel or plaster smooth to any thickness or wash coat. It air sets weld-tight to flint hardness and adheres firmly, even to steel.

Make an on-the-job test. Try several drums of Super #3000, the strongest of all refractory bonding materials. You'll never again settle for lesser quality.

R&I SUPER #3000 Refractory Cement

REFRACTORY & INSULATION CORP.

118 Wall St., New York 5, N. Y.

(Continued from page 92)

and has its main offices in Tulsa. The supply company in California is a subsidiary of the Bethlehem Pacific Coast Steel Corp., with main offices in Los Angeles.

Nordberg Manufacturing Co. — Appointment of Prime-Best Inc., 3820 West Villard Ave., Milwaukee, Wisconsin as distributor for 4FS diesel engines has been announced. The company will cover the southeastern territory of Wisconsin, and maintains small branch offices in Elkhorn, Racine and Madison.

Appointment of Francis W. Cross as sales engineer, heavy machinery div., is announced.

F. W. Cross

R. Thomas

Insul-Mastic Corp. of America—Raymond Thomas, insulation specification engineer of the Union Carbide and Carbon Corp., spoke on vaporsealing for thermal insulation, at the first Annual Sales Forum of the Insul-Mastic Corp. Sterling L. Ross, protective coatings engineer for the Pure oil Co. spoke on protective coatings for the petroleum industry. Elmer R. Queer, prof. of engineering research at the Pennsylvania State College and chairman of the thermal insulation committee of the ASTM, talked on vapor transmission.

Raybestos-Manhattan, Inc.—To fill the vacancy left by the sudden passing of Harry V. Snyder, factory manager, the following new appointments for the Manhattan Rubber Div. have just been announced: R. J. Gorecki, factory manager; W. E. Perkins, assistant factory manager; D. J. Fenelon, director of labor relations; R. Griffith, personnel manager; J. Freeland, manager cord belt department; A. P. Schneider, superintendent cord belt department.

General Electric Co.—Election of Ralph J. Cordiner as president to succeed Charles E. Wilson, named chairman of the Defense Mobilization Board, was announced. Mr. Wilson announced that he was severing all connections with corporate and banking institutions. He completed 51 years of continuous service in November. Mr. Cordiner, who has been with General Electric for 24 years and has served as manager of five of the company's departments during that period, has been executive v-p and a director of the company since 1949.

George W. Marsh has been elected

(Continued on page 96)

Pritchard's *New* Type "E" Quintair*

AIR COOLED HEAT EXCHANGER

For Low Cost, Efficient Cooling or Condensing of Liquids, Gases or Vapors

- Lower Operating Costs
- Higher Efficiency
- Fewer Parts to Assemble
- Lower Maintenance Costs
- Lower Installed Cost
- Many Industrial Uses

Other types of Quintair* units also available to meet your requirements.

Write for FREE Bulletin No. 11.0.080

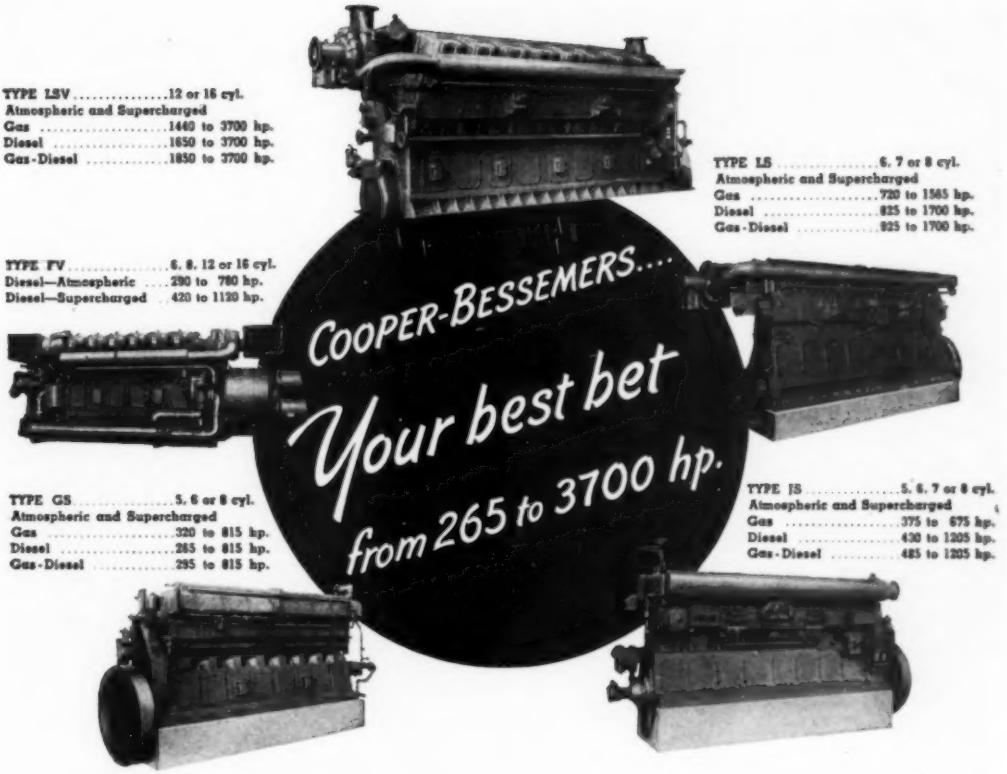
*Registered Trade Name

EQUIPMENT DIVISION

J.F. Pritchard & Co.

Dept. No. 93 — 908 Grand Ave., Kansas City 6, Mo.

District Offices:
CHICAGO • HOUSTON • NEW YORK • PITTSBURGH • TULSA • ST. LOUIS
Representatives in Principal Cities from Coast to Coast


TYPE LSV ..... 12 or 16 cyl.
Atmospheric and Supercharged
Gas ..... 1440 to 3700 hp.
Diesel ..... 1650 to 3700 hp.
Gas-Diesel ..... 1850 to 3700 hp.
TYPE LS ..... 6, 7 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 720 to 1565 hp.
Diesel ..... 825 to 1700 hp.
Gas-Diesel ..... 925 to 1700 hp.
TYPE FV ..... 6, 8, 12 or 16 cyl.
Diesel—Atmospheric ..... 290 to 780 hp.
Diesel—Supercharged ..... 420 to 1130 hp.
COOPER-BESSEMERS....
Your best bet
from 265 to 3700 hp.
TYPE GS ..... 5, 6 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 320 to 815 hp.
Diesel ..... 265 to 815 hp.
Gas-Diesel ..... 295 to 815 hp.
TYPE JS ..... 5, 6, 7 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 375 to 675 hp.
Diesel ..... 430 to 1205 hp.
Gas-Diesel ..... 485 to 1205 hp.

Pictured above are Cooper-Bessemer stationary engines of five different types, all thoroughly work-proved, all offering the peak efficiency, long life and low maintenance for which Cooper-Bessemers are so well known. Note the horsepower ratings given. These are the latest ratings as influenced by refinements in design as well as new or improved operational features. And, as also indicated, you have a choice of oil, gas-diesel or full gas operation, atmospheric or supercharged, whichever is to your greatest advantage.

Above all, these Cooper-Bessemers are rugged, work-wise engines if there ever were any. From oil sumps to cylinder heads they are engineered to help you produce the power you need at the lowest possible cost.

If your plans call for new or replacement power, check with the nearest Cooper-Bessemer office. Be sure to get all the facts on the distinctive features that pay off for Cooper-Bessemer users time and time again.

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. Calmes Engineering Co., New Orleans, La.

This PART is never missing

This business was founded on SERVICE and we continue to consider SERVICE of the utmost importance. AIRETOOL Engineers are constantly alert to new ways in which our products can be made to serve you better. If you want sound advice and top service on your tube cleaning and tube expanding problems, write the AIRETOOL Manufacturing Co., 318 S. Center St., Springfield, Ohio.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

BRANCH OFFICES: New York, Philadelphia, Chicago, Houston, Tulsa, Baton Rouge

There's an AIRETOOL Tube Cleaner and Tube Expander for Every Type of Tubular Construction

(Continued from page 94)

an assistant comptroller, and will be responsible for the corporate and tax accounts divisions.

Henry A. Vaughn has been appointed manager of manufacturing of the Meter and Instrument Div. He succeeds Herbert L. Ross who recently was named manager of the G-E River Works at Lynn.

Aircraft jet engine and turbo-prop test, development and production center, involving more than 2¼ million sq ft of factory and office space, will be established at Lockland, O., to meet increased military needs.

Diesel Engine Manufacturers Assoc.—The annual meeting was held in Chicago on Dec. 12, 13 and 14 when the following officers and directors were elected: president, Otto H. Fischer, president of the Union Diesel Engine Co.; vice-president, A. W. McKinney, executive v-p of the National Supply Co.; vice-president, Marvin W. Smith, president of Baldwin-Lima-Hamilton Corp.; treasurer, Robert H. Morse, Jr., president of Fairbanks, Morse & Co.; William E. Butts, president of the Enterprise Div. of General Metals Corp.; Levin H. Campbell, Jr., executive v-p of International Harvester Co.; C. Paul Clark, president of Clark Bros. Co., Inc.; George W. Codrington, v-p of General Motors Corp.; M. C. Davidson, v-p of Ingersoll-Rand Co.; Robert E. Friend, president of Nordberg Manufacturing Co.; Gordon Lefebvre, president of The Cooper-Bessemer Corp.; William S. Morris, v-p of American Locomotive Co.; E. J. Schwanhausser, executive v-p of Worthington Pump and Machinery Corp.

C. H. Wheeler Manufacturing Co.—Appointment of F. L. Yetter as senior v-p has been announced. He rejoins the company after a twenty-month period as director of foreign affairs for the Kuljian Corp.

Worthington Pump and Machinery Corp.—H. C. Ramsey, president, announced acquisition of Wintroath Pumps, Inc., of Alhambra, Calif.

Acquisition of the land, buildings and equipment of the National Transit Pump and Machine Co., now being dissolved, has been announced.

H. K. Porter Co., Inc.—A $1,500,000 expansion of plant and manufacturing facilities for Quaker Rubber Corp. Div. was announced.

For diversification of its manufacturing operations, the Delta Star Electric Co. of Chicago has been acquired.

OBITUARIES

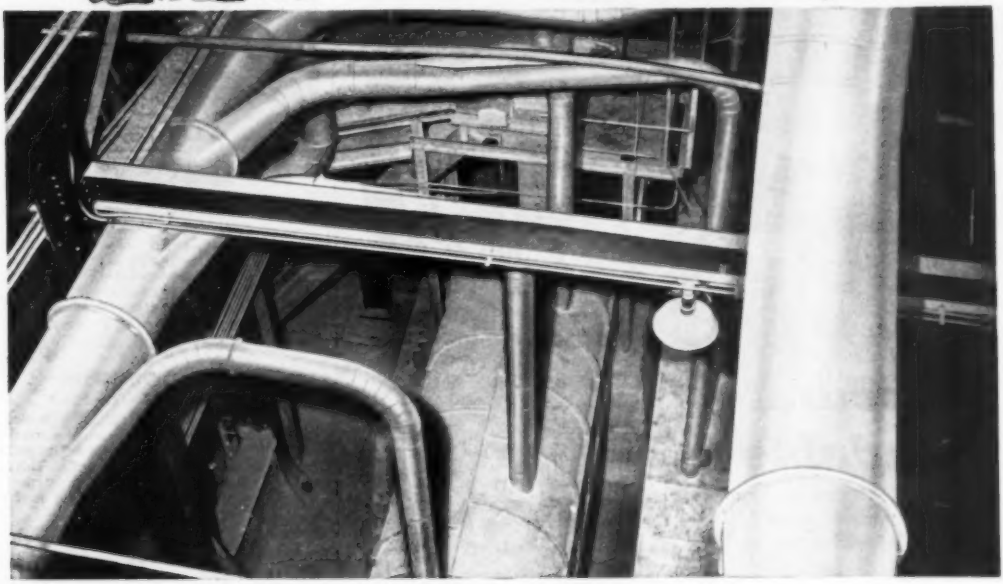
Henry Vogt Machine Co., Inc.—G. A. Daeuble, Jr., v-p and manager of valve and fitting sales died Nov. 26.

Raybestos-Manhattan, Inc.—Harry V. Snyder, factory manager of Manhattan Rubber Div. died December 2.

Gardner-Denver Co.—Arthur W. Dale, 53, general manager of sales of the Mining Div. died December 18.

Dust takes the easy way out!

...through a Kirk & Blum Dust Control System



Dust Control System on Rotary Breaker Screen and sand handling system in a casting plant of one of the nation's largest steel companies.

The large volumes of dust produced in the sand handling operations of this plant are not a problem. As soon as dust is formed, it is removed by the KIRK & BLUM Dust Control System.

One of the many KIRK & BLUM foundry installations, this Dust Control System meets every requirement of the American Foundrymen's Association code; heavy gauge piping has flanged joints and convenient clean-out doors.

Hundreds of plants, large and small, have found it pays in *greater operating efficiency* to have a dust or fume control system designed and installed by experts. For all three—design, fabrication and installation—call on KIRK & BLUM.

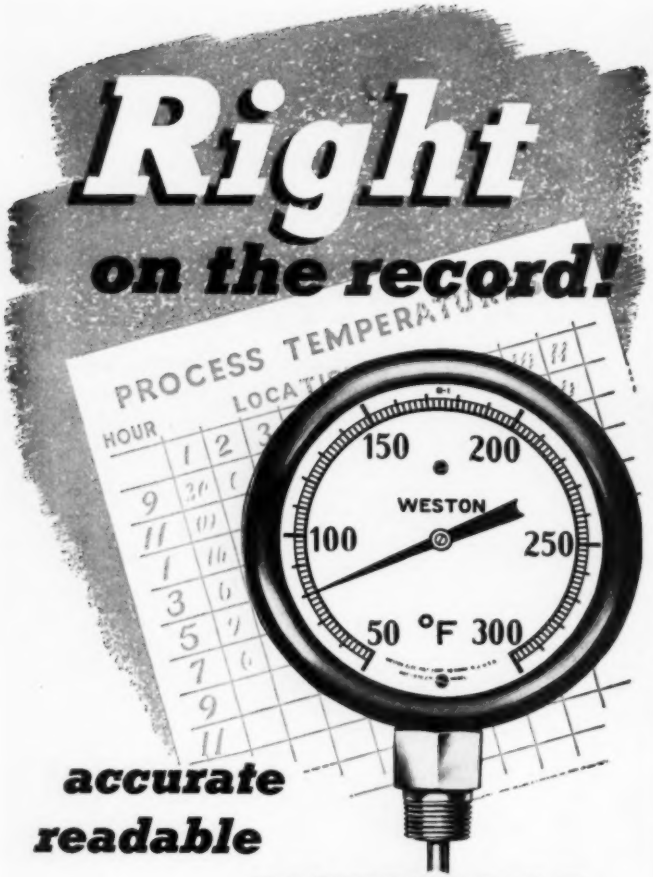
If you need a new dust control system . . . or more capacity in an existing one, contact KIRK & BLUM. They'll gladly prove the money-saving efficiency of systems by KIRK & BLUM, specialists in dust and fume control for more than 43 years. For Booklet, write The Kirk & Blum Mfg. Co., 2874 Spring Grove Ave., Cincinnati 25, Ohio.

One Undivided Responsibility
DESIGN...FABRICATION...INSTALLATION
For all three—call on K&B

FOR CLEAN AIR... THE INVISIBLE TOOL

KIRK AND BLUM

DUST CONTROL SYSTEMS



WESTON

ALL-METAL THERMOMETERS

An accurate temperature record requires more than just instrument accuracy. It requires instrument readability as well. That's why WESTON Thermometers are so widely used for critical applications. A quick glance at their bold, open scales gives you the *exact* reading... no question or doubt about it. Combined with the long-time accuracy and the ruggedness for which they are famous, this feature of readability can be worth dollars to you. Why not send for complete literature today. Weston Electrical Instrument Corporation, 605 Frelinghuysen Avenue, Newark 5, New Jersey... Manufacturers of Weston and Tagliabue Instruments.

WESTON *Instruments*

NEW EQUIPMENT AND DEVELOPMENTS

(Continued from page 16)

321—PHOTO-COPIER MAKES COPYING EASY

A portable photo-copier, which will copy 9 x 14 in. legal-size documents and curved, tightly bound pages is now available from F. G. Ludwig Associates. It makes copies in a matter of seconds, and it eliminates the inconvenience of sending out valuable papers or books from libraries. It copies under normal artificial room lighting without fogging the paper, and saves time, work and

expense in making exact permanent copies. The "Contoura" model combines portability with speed, convenience and economy and is simple to operate. It is compact and light —only 6 lb—and fits into a briefcase. Photographic copying paper is placed on the subject matter to be copied. The unit is placed over the copy paper and the switch turned on for an appropriate time exposure. At the operator's convenience, the photo paper can be developed.

322—DISPLACEMENT METER OPERATES AT 1000 PSI

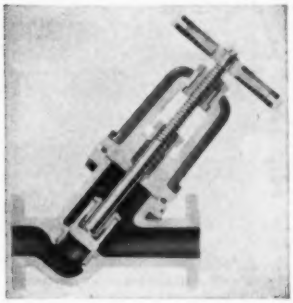
Rockwell Mfg. Co., has made it possible for transmission companies, gas producers and utilities to meter accurately wide ranges of delivery of gas at the take-off point. This meter, for 1000 psi working pressure, weighs 950 lb, is encased in high-tensile alloy steel

castings with 1¼-in. studs (not bolts) joining the body and cover. It boasts capacities of 31,000 and 46,000 cfh of gas at pressure drops of 6 and 10 in. w.c. respectively. Significant design features are: (1) unusual ribbing of the heavy cast body so stresses are uniformly distributed around the periphery of the body; and (2) support of all moving and working parts on a single plate held between body and cover so that alignment

is permanent and all working parts can be removed as a unit for inspection or repair without taking the meter out of the line.

323—VALVE CONTAINS MONEL METAL PARTS

Everlasting Valve Co. announces the addition of a Straightway "Y" type valve to its line of boiler blow-off valves. It is built in strict conformance to the ASME Boiler Code. The disc is made of "H" monel metal and the seat of monel metal. This com-

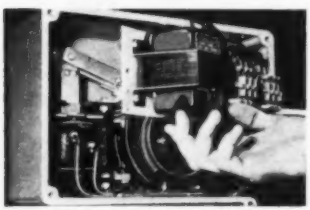


bination of metals withstands the erosive and corrosive conditions to which a slow opening blow-off valve is subjected. Upper and lower scaling gaskets protect the seat threads from corrosion. The stem is made of stainless steel, and the stem nut is made of bronze to provide longer life. All parts are easily renewable without the use of special tools. These valves are offered in 1½, 2 and 2½ in. sizes, in cast iron or cast steel, for pressures up to and including 600 psi.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

324—TRANSFORMER PANEL FACILITATES SERVICING

Swing-out transformer panel, which facilitates servicing and adjustment of Bob-Cat electric cable hoists, is announced by The Cleveland Chain & Mfg. Co. The supply line transformer—reduces current at the push-button control to 110-v—can be swung



out of the way, and the motor brake is accessible for routine adjustments. Necessity of removing attachment bolts or disconnecting electrical leads, two service operations commonly required in ordinary hoists, has been eliminated. The new panel is held securely in place by one quick attachment, quick release slotted head screw.

(Continued on page 101)

A BETTER, FASTER WAY TO MOVE HARD-TO-HANDLE MATERIALS

THE HEWITT-ROBINS VIBRA-VEYOR® . . .
Up to 200 Feet of Pan Length on One Vibrator!

Moves anything you can't handle with a belt conveyor! Hot or cold, wet or dry, lump or pulverized, packaged or bulk . . . this Hewitt-Robins Vibra-Veyor moves it quickly, quietly, efficiently, at low cost.

Convey material up to 200 feet on one vibrating unit—horizontally . . . down-hill . . . on grades up to 10%. Save on power!

Load it to the hilt at several points along the pan, with any material. It won't bog down. Capacity is limited only by the size of the troughed pan.

Give it rough shock loads! Pan sections are supported by tough malleable iron rockers and soft coil springs—springs that counteract shock loads. The Vibra-Veyor is amazingly quiet—has a full-floating vibrating mechanism.

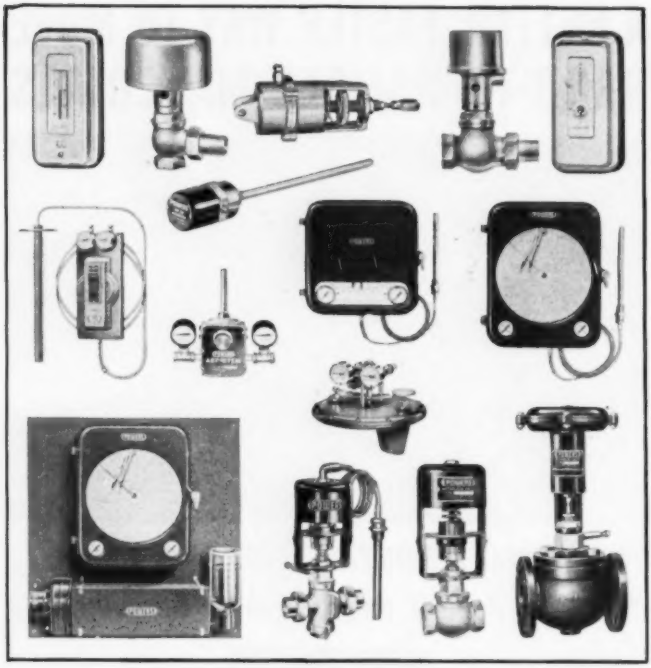
Install it easily! No special foundation needed, because there's no vibration in the base structure. Your own men can anchor it. Simple to maintain—only 4 points to lubricate.

Applications almost limitless! Tell us your hard-to-handle materials handling problem, and we'll build a Vibra-Veyor to solve it. Get the whole story in Bulletin 135. Write to Robins Conveyors Division, Passaic, New Jersey.

HEWITT-ROBINS VIBRA-VEYOR

HEWITT-ROBINS INCORPORATED

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS
CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS
FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS
RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS
TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS



For STABILIZED Heat and Humidity

POWERS

Pneumatic TEMPERATURE and HUMIDITY Control

★ Often Cuts Fuel Consumption 15 to 25%
★ Increases Output of Workers ★ Improves Quality of Many Products

Prevent OVER-heating, save fuel, increase comfort and efficiency of people in heated rooms with a Powers pneumatic system of temperature control. A sound, highly profitable investment for heated and air conditioned buildings.

Constant temperature and humidity conditions in each room can be maintained at any predetermined point with a POWERS system of pneumatic control.

Phone or write your nearest Powers office for an engineer to call and study your requirements for better temperature control. An estimate entails no obligation.

THE POWERS REGULATOR CO.

Established 1891 • OFFICES IN OVER 50 CITIES • See Your Phone Book
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MEXICO, D. F., Edificio "La Nacional" 601 (HAG)

BETTER WATER

IS AN ASSET TO THE ENTIRE COMMUNITY

Manufacturing, processing, heating and cooling always improves with pure, bright water. If your water supply needs treatment to remove hardness, iron, taste or odor it will certainly pay to have your problem surveyed by GENERAL FILTER CO. engineers.

G.F.C. is part of the LAYNE organization with engineering and construction facilities in every area. A complete service is offered, from the first survey to the installation of economical and efficient water purification equipment.

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GENERAL FILTER CO.
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High Pressure Steam *at Low Cost*

SCOTTIE JR®

KEWANEE®

6 sizes for 6 to 36 hp at 100 lbs wp . . . For coal, oil or gas . . . hand or mechanically fired.

Check the proportions of each Scottie Jr. and you'll see why it will actually produce approximately double the horse power guaranteed by its rating.

WRITE Department **96-D2**
for 6" scale with pipe diameter markings

KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS

(Continued from page 99)

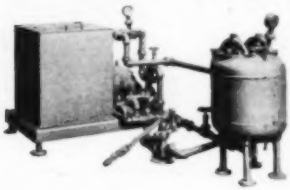
325—AIR VIBRATORS HAVE VARIED APPLICATIONS

Spo, Inc. announces the availability of their Series 79 air vibrators. Designed for operation on standard 80 psi line pressure, they are recommended for use on hoppers, tables, molding machines and chutes. Bodies

are cast from semi-steel. A combination end-plate mounting-bracket is held in place by one-inch alloy-steel bolts. These units employ a special bronze alloy cylinder liner, which assures smooth, positive operation and provides for a long, maintenance-free service life. Operation can be continuous or intermittent.

326—POROSITY IN CASTING ELIMINATED

Impregnating equipment for sealing pressure castings rejected because of porosity has been announced by the Tincher Products Co. This unit has been designed to solve "leaker" problems in small parts and castings. The process is simple, effective and



economical. The equipment is complete and requires no expensive plant alterations or skill for operation. Metals, both ferrous and non-ferrous, may be sealed either before or after machining. Once an impregnated part has been washed in cold water, no evidence of the impregnation remains except that it is pressure tight.

327—SENSITIVE RELAY HERMETICALLY SEALED

Sigma Instruments, Inc. is offering a small hermetically sealed relay that measures 1 in. by 1¾ in. high, exclusive of the terminals. It can be furnished also with a second pole on the switch structure. The senitivity of D. P. standard units is approximately 40 mw. Such relays withstand better than 10 g's vibration at frequencies in excess of 60 cps. When 2 to 1 margins for "operate" and "release" currents are provided, the new mini-

(Continued on page 103)

TAKE A DART APART!

you'll see at once why DARTS are your best buy!

To get top resistance to stress and stretching, we've made body and nut of high-test, air-refined malleable iron.

Special oscillating grinders give these non-corroding bronze seats a true bearing surface.

Extra width of seats ensures a drop-tight joint without excessive wrenching.

No danger of deforming or stripping with full, clean-cut threads like these.

It's an extra heavy nut so it'll easily shrug off careless wrenching.

No wonder you can use Darts again and again — always count on them for extra service at lower costs.

DART

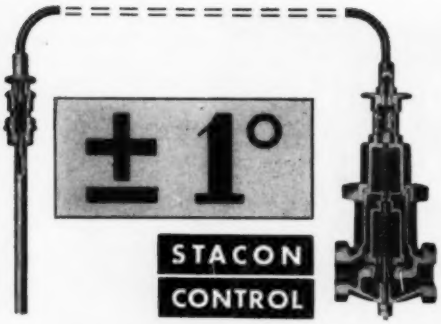
DART

UNION COMPANY

PROVIDENCE 5, RHODE ISLAND

THE FAIRBANKS CO. — Distributors

Boston • New York • Pittsburgh



Temperature regulation to plus or minus one degree F. is the unheard-of accuracy obtainable with the self-operated Farris Stacon Temperature Regulator.*

Two design factors are responsible:

1. Liquid in bulb flashes to vapor in power bellows — steam does 99 per cent of the work...without appreciable time lag.
2. Full balancing bellows has the effect of double seated operation with single seated valve.. eliminates spring counterpoise and all packing glands.. provides free-floating valve disc...prevents response to variations in steam temperature.

Stacon Regulators are compact, trouble-free, dirt-proof. They operate consistently in the worst possible surroundings and require no maintenance.

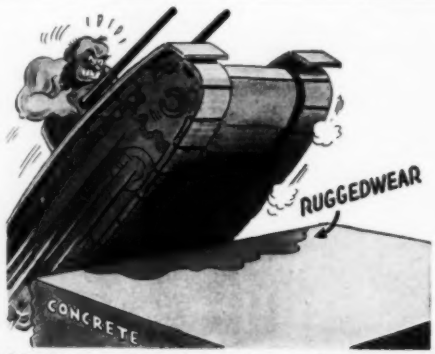
You'll want to learn more about the most sensitive, accurate, economical temperature regulator on the market. Write for Stacon Bulletin 50-1000.

*PATENTED

Farris Stacon Corp.

436 COMMERCIAL AVE. PALISADES PARK, N. J.

4689



All-Out Production Demands SMOOTH, TOUGH FLOORS

If you want smooth floors, even under the most punishing traffic conditions . . . make repairs or resurface an entire area with tough RUGGEDWEAR. Resurfacer. No chopping or chipping required. Merely sweep out spot to be patched — mix the material — trowel it on. Holds solid and tight right up to irregular edge of old concrete. Used indoors or out. Dries fast.

MAIL COUPON for FREE TRIAL OFFER and HAND BOOK OF BUILDING MAINTENANCE

FLEXROCK COMPANY Offices in Principal Cities
3605 Filbert St., Philadelphia 4, Pa.
Please send me complete RUGGEDWEAR information, details of TRIAL ORDER PLAN and HAND BOOK OF BUILDING MAINTENANCE — no obligation. (Clip and attach Coupon to Co. letterhead)

Name .....
Company .....
Address .....

Pipe joints sealed with Key-Tite cannot leak. Key-Tite is a perfect seal on all lines carrying water, gas, low-pressure steam, compressed air, etc. It contains no lead or substitutes and does not affect the taste or odor of potable liquids. Joints are easily opened, too, for it will not freeze in the joint. Stop losing money through leaky pipe joints...seal with Key-Tite.

Send for Free Sample
Try Key-Tite in Your Own Plant at Our Expense

KEY Company

KEY COMPANY
321 S. 27th St., East St. Louis, Ill.

ILLINOIS

Thermostatic Traps

for Medium and High Pressures

Series HG

Maximum Working Pressure 150 pounds gauge

For trapping instrument sterilizers, water stills, coffee urns, warming tables and similar equipment.

Where appearance, compactness and smaller capacities of the trap must be considered, it is sometimes preferable to use a high pressure thermostatic trap, as illustrated, instead of a float type.

WRITE FOR LITERATURE

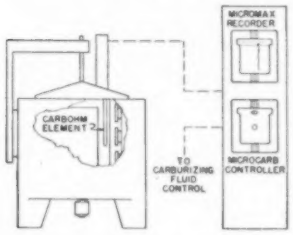
ILLINOIS ENGINEERING COMPANY
INCORPORATED 1906
RACINE AVENUE AT 21ST STREET • CHICAGO 8

(Continued from page 101)

ature relay can be used under conditions of sustained acceleration as high as 50 g s. The switch structure is coupled to the armature in such a way that contact wear scarcely changes pull-on and drop-out points. Under most operating conditions, the individual switches close without bounce.

328—HEAT-TREATING DEVICE CONTROLS SURFACE CARBON

Leeds & Northrup Co. makes possible the measuring and controlling carbon potential of heat-treating furnace atmosphere directly in terms of per cent carbon. By means of their "Microcarb" control, the surface carbon content of steel can be regulated as ac-



curately as they regulate temperature. Atmosphere can be adjusted to increase or decrease carbon potential automatically for surface carburizing, homogeneous carburizing, carbon restoration hardening and annealing. Principal feature of the carbon control system is a Carbohm detecting element, which projects into the furnace work chamber like a thermocouple, and electrically "senses" the carburizing potential of the furnace atmosphere. Connected to this element is a controller, which automatically adjusts the flow of carburizing fluid to hold carbon potential of furnace at any selected value between 0.15 and 1.15 per cent carbon.

329—ADHERING COMPRESS EASILY APPLIED

First aid bandage-compresses, that can be put on with one hand by the injured person himself, are announced by the First Aid Div. of Davis Emergency Equipment Co., Inc. The bandage-compress is known as the Davis Self-Adhering Compress Bandage. It is impregnated with an adherent substance that makes each layer of bandage adhere firmly to the one below, yet not adhere to the skin. The bandage can easily be put in place by pinching together the first loop of bandage and then winding the balance on. The end of the bandage remains securely in place without tying, pinning, or using adhesive tape. It can be applied tightly and, because of the adhesive qualities, retains the tension without slipping or unwinding.

FOR BETTER VALVE AND UNION PERFORMANCE:

FAIRBANKS

All Star Team

An unbeatable combination — the "first string" team of valve and union for dependable trouble-free piping installations.

Look at the lineup:

U-01 BRONZE GLOBE VALVE

★ Renewable Composition Disc

Perfect sealing at all times—

A disc for every type of service—

#50—a hard disc for general usage

#52—a rubber disc for cold water valves

#60—a special synthetic disc highly resistant to gasoline, oils and many acids and alkalies.

★ Two Piece Union Bonnet
—Quick, easy disassembly
—No sliding or scraping between body and bonnet—NO WEAR

★ Radial Seat of Two Piece Union Bonnet
—Leak-proof Body Bonnet Joint
—Rigid alignment of all parts—guaranteed perfect seating all the time.

DART UNION

★ Ground Ball Joint having extra wide seating surfaces

★ Two Bronze Seats, non-corroding, on both sides of the seat

★ Leak-proof without excessive torque because of true bearing surfaces

★ High-test air-refined malleable iron body will not stretch, practically unbreakable.

THE Fairbanks COMPANY
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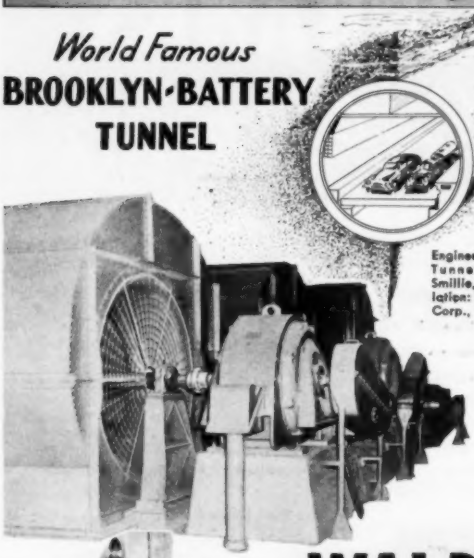
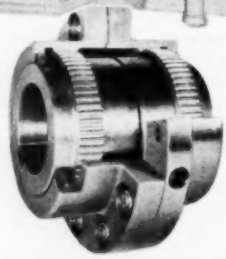
VALVES • DART & PIC UNIONS • TRUCKS • CASTERS

...consistently specified for the outstanding engineering projects

World Famous
BROOKLYN-BATTERY TUNNEL

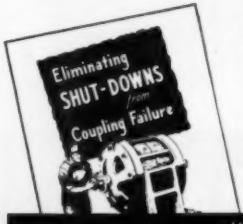


Engineering: Tri-Boro Bridge & Tunnel Authority — Ralph Smillie, Chief Engineer. Ventilation: Westinghouse Electric Corp., Sturtevant Division.



WALDRON
the advanced gear type
Coupling

To insure dependable and continuous expulsion of deadly exhaust gases in America's longest vehicular tunnel required the best in engineering skill, ventilating apparatus and power driving equipment. More than 100 Westinghouse motors drive the huge Westinghouse fans and to secure the maximum assurance to continuous trouble-free service WALDRON Couplings were selected for each drive. No finer testimonial to the all-round quality of the WALDRON Coupling could be had than their selection for this notable engineering project.



Write for your copy

of this new folder which explains in detail the common sources of coupling failure and how they can be avoided. Useful information for every coupling user. Copy will be sent promptly on request.

MANUFACTURED BY
JOHN WALDRON CORPORATION
New Brunswick, New Jersey
Sales Representatives in Principal Cities.

(Continued from page 24)

when power is interrupted. Bulletin shows how it's done. Application photos, installation diagrams and complete specifications are included. Stephens-Adamson Mfg. Co.

Continuous Blast Cleaning (2M). If you are losing time and money because of a bottleneck in your cleaning department check up on continuous airless abrasive blast cleaning machines. Speed can be adjusted to meet any requirement. Illustrated 8-page booklet explains the advantages offered and cites actual production figures for the five sizes of the units. American Wheelabrator & Equipment Corp.

Vibrating Screens (2N). Twenty years' experience in designing and building vibrating screens are embodied in 12-page bulletin on concentric-action vibrating screens for medium and heavy duty. Screens for accurate sizing, thorough rinsing and rapid de-watering of a wide range of materials are illustrated, described and tabulated. Detailed dimensions, weights and other engineering layout data are given. Includes a page on how to select the right size screen for handling a given capacity per hour. Link-Belt Co.

POWER TRANSMISSION

Speed Control Equipment (2R). From 3 basic units Reeves builds a complete line of speed control equipment that is simply designed, ruggedly built and easily maintained according to 12-page bulletin. All are adaptable to new machine designs or may be installed on machines already in service. Over 2000 different makes of machines now employ the units as standard equipment. Booklet contains discussion of features and operating principles along with tabulations of hp ratings and dimensions. Controls and indicators — both standard and extra — are pictured and described. Two pages of general engineering information round out the book. Reeves Pulley Co.

Cut-Out Couplings (2S). Automatic device that instantly shuts off the power when any kind of overload occurs is introduced in 12-page catalog. Offers torque sensitive protection combined with the features of a flexible coupling, says the booklet. Full description along with a discussion on the many possibilities included. Anchor Steel and Conveyor Co.

Fluid Power Equipment (2T). Complete line of fluid power pumps, motors, transmissions, cylinders and valves is featured in 8-page bulletin. New lines in small constant and variable delivery pumps, and axial piston motors are shown along with improved standard and heavy duty cylinders for pressures up to 3000 psi. Valves for controlling the cylinders are listed. The Oilgear Co.

Micarta Gears (2U). An introduction to micarta gearing is provided in 15-page booklet that offers micarta gear manufacturing know-how. Machining, designing and application information is given along with illustrated explanations. Lists physical properties, preferred pitch and gear data for full

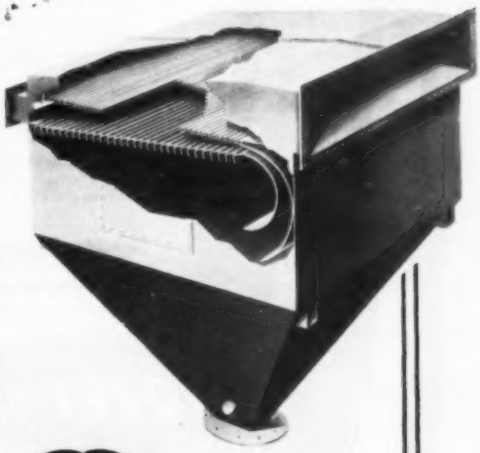
"What?... an efficient Dust Collector designed especially for small boilers from 100 to 2000 BHP?"

THERE SURE IS.....

The *new* Buell "LR" Fly Ash Collector gets 99% of all 100-mesh cinder discharge!

Boasts draft loss so low, you can even use it effectively on natural draft boilers!

For full information on how the Buell "LR" Collector can help solve your Fly Ash Problem, write today to: Buell Engineering Company, Suite 5017, 70 Pine Street, New York 5, N. Y.



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Engineered Efficiency in **Fly Ash Collection**

A QUICK ECONOMICAL way to clean small tubes

ROTOJET® Junior Tube Cleaners offer advantages possessed by no other type. They are light in weight, fed easily with the hose, and shifted quickly from tube to tube.

The ROTOJET Motor is unusually powerful and efficient. It has only two moving parts, a shaft and a paddle. Positive contact, maintained between paddle and Rotocentric (egg-shape) bore cylinder, assures an undivided air stream and freedom from power loss. An air valve permits one-man operation. Models for straight and curved tubes .495" I.D. up. Water-driven models for tubes .953" I.D. up.

ROTOJET size, speed, and ease of operation offer a marked contrast with external cleaners costing many times as much. Send for new bulletin.

Roto Heads are economical

Roto Heads meet practically every cleaning need. Expanding brushes and scrapers have inexpensive replaceable elements for economical operation.

Expanding brush, ball joint, replaceable brush element.

Expanding scraper and replaceable element.

Wire brush and adapter.

Sectional wire brush.

ROTOJET Junior TUBE CLEANERS

ELLIOTT COMPANY-ROTO DIVISION

156 Sussex Avenue **Newark 1, N. J.**

depth teeth, in addition to illustrated examples of micarta-gear hp-rating formulas. Also listed are 57 applications of the gears. Westinghouse Electric Corp.

Uni-Pull Drive Manual (2V). This 40-page book enables you to select without any calculation, the proper size flat leather belt together with pulleys of the correct dimension, to transmit power from a motor of given hp and speed to a machine to be operated at a prescribed speed. Includes tables from which belt tension controlling motor base can be selected for motors built in standard NEMA frames. Also contains basic hp rating data for flat leather belting, recommended minimum pulley diameters and other pertinent drive information. American Leather Belting Association.

PUMPS AND ACCESSORIES

Screw & Rotex Pumps (2Y). Warren's acquisition of the Quimby Pump Div. has, among other things, produced two bulletins illustrating and describing the latest refinements in screw and Rotex pumps. Screw pumps are available in capacities up to 3000 gpm and pressures up to 200 psi, while Rotex pumps have capacities up to 100 gpm and pressures up to 250 psi. Warren Steam Pump Co., Inc.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

Mechanical Packings (3A). Compiled for the busy engineer, this easy-to-read, 32-page catalog graphically illustrates and describes a complete line of mechanical packings for general applications. Recommendation chart to simplify selection of packings for a particular use is included. Flexrock Co.

TOOLS AND SPECIALTIES

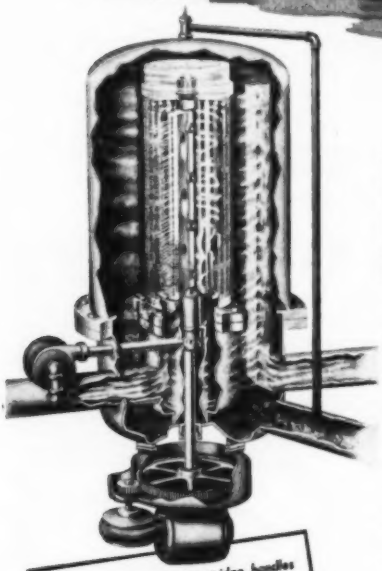
Slide-Set Vise (3C). Handle spinning is eliminated—the jaws slide to any position and as the work is engaged the vise operates conventionally. Full information on this new development in vises is contained in 4-page well-illustrated bulletin. Dodge Mfg. Co.

Portable Winch-Hoist (3D). Versatile hoist, weighing only 8½ lb, that can be instantly rigged to either lift, pull or lower 1½ tons for 7½ ft, or ¾ ton for 15 ft is pictured and described in 4-page bulletin. Features include aluminum alloy construction, oiled-for-life bearings, interlock pawl arrangement for safety. Can be made tamperproof by removing handle. Built-in pulley block and three swivel hooks permit working around corners or in close quarters. The Lug-All Co.

VALVES, PIPING AND FITTINGS

Valves, Fittings, Flanges (3H). If you're dealing with liquids and gases of any sort, under high or low pressure you will be interested in this 400-page catalog. Drop forged steel valves,

QUICK, HENRY, THE FILTER!



Permanent wire-wound cartridge handles full flow. Continuously self-cleaning—no flow interruptions. All-metal construction is abrasion- and corrosion-resistant.

If water's getting scarce in *your* area . . . use river or lake water for industrial purposes. Make it fit for those purposes by straining through a Cuno FLO-KLEAN Strainer to remove trash.

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Clean process water for re-use by passing it through a Cuno FLO-KLEAN—*guaranteed* to remove all solids larger than specified*, with negligible drop in pressure.

Even the FLO-KLEAN falls in with the spirit of saving water. Its cartridge cleaning system recycles the backwash—no waste.

INSTALL AND FORGET

The FLO-KLEAN takes care of its own cleaning, too. With continuous cartridge backwash cleaning and automatic top and bottom blow-down, it can be installed in a remote place and forgotten.

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Some users have saved enough on water bills to pay the cost of FLO-KLEAN in a matter of *months!*

Send the coupon for full information on water-saving, money-saving FLO-KLEAN strainers.

**Available spacings from .0025 to .030 in. (220 to 20 mesh equivalent)*

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Complete Line *Fluid Conditioning*

Removes More Sizes of Solids from More Types of Fluids

MICRONIC (Micro-Klean) • DISC-TYPE (Auto-Klean)
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Please send information—without obligation—on Cuno FLO-KLEAN for application noted:

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LUBRICATION ECONOMY

"LUBRIPLATE saved us $2,098.16 in seven months"

The BROWN COMPANY, Quality Paper Makers of Berlin, New Hampshire, said this in an operating report on one of their Kraft Mill Lime Kilns after changing over from conventional oil lubrication to LUBRIPLATE No. 130AA. Huge savings like this cannot be overlooked. It is worth your while to see what LUBRIPLATE Lubrication can save you.

1. LUBRIPLATE reduces friction and wear
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Write today for case histories of savings made through the use of LUBRIPLATE in your industry.

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Fiske Brothers Refining Co.
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New VERSENE* test kit determines total water hardness in less than TWO MINUTES

Now, with this new Versene* water hardness testing kit you can determine the hardness of your own boiler, process or tap water as easy as ABC—in less than 2 minutes. Anyone who can tell red from blue can make this scientific versenate test and be accurate within one grain of hardness per gallon.

Handy, sturdy, pocket-size plastic kit contains 3 vials of chemicals and one combination measuring and mixing vial. More than 50 separate tests can be made, depending on water hardness. Complete instructions. Refills available.

Order The New Versene* Water Hardness Testing Kit today. $5.00 Postpaid. Send Checks or M.O. No C.O.D.'s Money Back Guarantee.

We also manufacture and supply Inhibited Indicator and Di Sodium Versenate (the di sodium salt of ethylene diamine tetra-acetic acid). These are the reagents used in the Versenate (Schwartzenbach) Method for the determination of Water Hardness.

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50 g. $2.00 — 100 g. $3.00 — 500 g. $10.00
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100 cc $1.00 — 250 cc $2.00 — 500 cc $3.00 — 1000 cc $5.00

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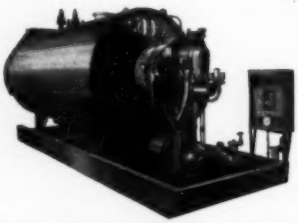

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60 to 500 Horsepower plus ample overload.
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Zoom down on Dirt, Dust, and Grit with a CLEMENTS-CADILLAC blower-suction cleaner, and you've got the enemy on the run. Use this powerful air weapon to rout the trouble makers from every crack and crevice of your machinery and equipment. Deal 'em a hard blow —regularly.

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PREVENT DAMAGE TO MACHINERY
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Made in 5 models with attachments for every cleaning job.

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ASK YOUR MILL SUPPLY DEALER OR WRITE US FOR DATA

fittings and flanges for every modern piping need are pictured and described. Special section on refrigeration is incorporated in the book. Henry Vogt Machine Co.

Reducing Valve (3J). Used to protect water lines where high initial pressure would cause serious damage, this "Cushioned" water pressure reducing valve is fully covered in 6-page bulletin. Installation, operation, adjustment, servicing and specifications are fully described. Tables show general dimensions and weights. Golden-Anderson Valve Specialty Co.

Flexible Ball Joints (3K). Most comprehensive bulletin on this subject ever published—that's what Barco says of its 16-page booklet aimed at design as well as plant engineers. Flexible ball, swing, swivel, revolving and other types of movable joints for use in piping for power, process, heating, chemical or hydraulic service are thoroughly discussed. Contains complete specifications, dimensions and application data. Barco Mfg. Co.

Drainage Manual (3L). To assist engineers and superintendents in the proper methods of installing drainage structures, culverts, sewers or conduits this company offers an illustrated 46-page installation manual. Discusses the handling of metal drainage products, location, proper excavation and preparation of base in various types of soils and rock. Armco Drainage & Metal Products, Inc.

For more information use one of the convenient reply cards on page 85. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

Light-Weight Pipe (3P). Lockseam Spiralweld pipe give plus performance on jobs in the power plant, materials handling, mining, oil, and sewage disposal fields says 4-page illustrated bulletin. Include typical applications along with data on fittings, flanges, connections and pipe specifications from 4 to 30 in. ID. Naylor Pipe Co.

HEATING, VENTILATING AND AIR CONDITIONING

Dust Control (3T). Dust—both inside and outside the plant—is one of industry's most troublesome problems. Here are 26 pages of valuable information on air cleaning and dust control. Detailed charts on size and characteristics of air-borne solids accompany a full discussion on industrial atmospheric dust. Chapters on such various applications as industrial ventilation, drying operations, control of bacteria and mold spores, cooling electrical equipment, engines and compressors are presented. American Air Filter Co., Inc.

MISCELLANEOUS

Corrosion Proofing (3W). Metal-treating formulation (together with Prufcoat protective coatings) provides a simple two-step system for effectively corrosion-proofing old or moist metal

Boiler Gases

at Calco Go on Green

Twenty odd years ago, a new boiler was installed at the Calco Chemical Company's plant at Bound Brook, New Jersey. The induced draft and forced draft fans carried the 'Green' nameplate.

Five years later, another new boiler was installed at the same plant—a different make of boiler. Again the induced draft and forced draft fans selected were 'Green.'

Specifications for each of the Green Induced Draft Fans, called for 88,000 cfm maximum load at 350°F against 9" (water gauge) static pressure at 570 rpm.

Calco has an outstanding boiler plant and here as in so many other important boiler plants, Green Fans carry the load. They're soundly designed and strongly made. They give satisfactory service. Look into their values for your fan requirements.

THE GREEN Fuel Economizer COMPANY INC.
BEACON 3, NEW YORK
ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

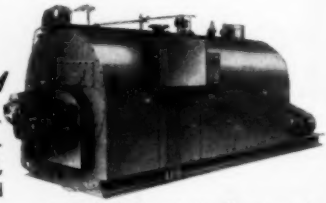
REDUCE! YOUR STEAM COSTS!

WITH A *Dutton* "PACKAGED"

STEAM GENERATOR

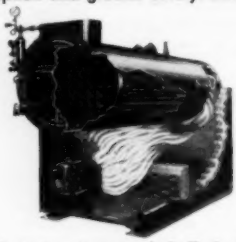
Dutton Steam Generators are QUALITY PRODUCTS, incorporating exclusive features of LONG LIFE, LOW OPERATING AND MAINTENANCE COST, MAXIMUM EFFICIENCY and SAFETY that only 71 years experience in boiler making can produce. Dutton Automatic "Packaged" Steam Generators are completely assembled — no special foundation or expensive chimney are needed.

Dutton EconoTHERM



Completely self-contained, automatically operated, 3-pass modified Scotch Internal Furnace type which gives twice the power in half the usual space. Features such as the Dutton Off-Center Firing and Rotary Combustion assure faster steam and more steam with less fuel consumption and greater safety. Burns gas or oil.

Dutton EconoMIST



A highly efficient horizontal return tube type, assembled in portable casing and ready for firing on arrival. Dutton improved shell design and double size full length, high bricked firebox, give faster steaming and longer steam carry-over with less fuel consumption. Burns oil, gas or coal with high efficiency — easily converted from one fuel to another. Available as a package unit with firing equipment, controls and mechanical draft with short stack.

Let us help select the best type for you.
Write for catalog IP251 on "Packaged" STEAM GENERATORS.

Dutton BOILER DIVISION
HAPMAN-DUTTON COMPANY
KALAMAZOO • MICHIGAN
Boiler Makers Since 1880

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- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
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surfaces. Technical bulletin furnishes necessary information on metal reactive primer. Prufcoat Laboratories, Inc.

Oilers Safety Chart (3V). Printed on heavy card stock suitable for hanging in a prominent position, this safety chart lists 15 "things to remember" when lubricating machinery. New York & New Jersey Lubricant Co.

Pipe Fire Protection System (3X). Highly flexible system that may be adapted to nearly all flammable liquid and electrical hazards which should be protected against fire is illustrated and described in 4-page bulletin. Drawings show typical applications and photos illustrate the equipment needed. Lists 15 hazards which can be best protected with dry chemical piped systems. Ansul Chemical Co.

Maintenance Checking Chart (3Y). Aimed specifically at plant and building maintenance superintendents is this 6-page chart. Lists many common building maintenance problems and recommends a solution for each. Over 100 products and processes are available for maintenance of floors, roofs, interior and exterior walls, waterproofing and paints, etc. United Laboratories, Inc.

Isometric Engineering (3Z). Isometrics, a development of modern engineering, shows the untrained worker by means of illustrated charts the correct rotation of assembled parts, eliminating special training. Explanatory 10-page booklet describes this method at work in the plant. The Isometric Co.

RESEAT VALVES AND BIBBS

IN PLACE

QUICKLY

ACCURATELY

RESEATING A BIBB

RESEATING A VALVE

PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!

Don't junk expensive globe or angle valves, bibbs, fixtures—reseat them! Order Skinner *Valve and Bibb Reseater*. Easy to use. Guaranteed cutters leave seat glass-smooth, level, tight.

1/4" to 2" $32.50
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SOUTH BEND 21, INDIANA, U.S.A.

HENSZEY *Boiler Feed* REGULATOR

***Keeps a* WATCHFUL EYE *on* BOILER WATER LEVELS**

• CONTINUOUSLY • AUTOMATICALLY • ACCURATELY
***under* ALL LOAD CONDITIONS**

They help avoid the hazards of high, as well as low, water levels. They function night and day—once installed and set for operator no attention is necessary — nothing to get out of order — nothing to rust.

A simple, compact unit — installs right in the line—no additional supports are necessary. Pressures up to 600 lbs., sizes up to 4 in. For details consult Sweet's Catalog or write:

HENSZEY COMPANY
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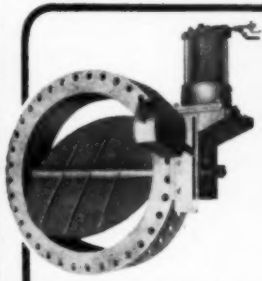
BOILER FEED REGULATORS

Continuous Blowdown • Distillation Systems • Heat Exchangers
Feed Water Meters • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS



42" butterfly valve with oil-operated cylinder and counterweight for 200°F service.

30" butterfly valve for 60 p.s.i. pressure, with Limitorque motor control and auxiliary handwheel, position indicating lights and push button.

ROCKWELL *AUTOMATIC* BUTTERFLY VALVES

Provide Automatic Flow Control and Quick Shut-Off of Air, Gases, Steam, Liquids, Semi-Solids.

A complete line of Rockwell Valves of any metal or rubber-lined; in pipe size to 72" and larger; with any type of automatic control and with auxiliary manual control, if desired.

We also manufacture manually controlled butterfly valves and slide valves in all sizes, metals and types for pressures to 100 p.s.i.

Write for Valve Catalog and ask to be put on our mailing list to receive "Rockwell Valvings" monthly.

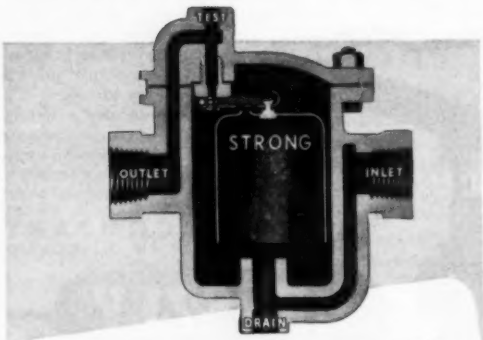
W. S. ROCKWELL CO.

230 Eliot St. Fairfield, Conn.

Get this *SMALL* TRAP

With

BIG TRAP quality features!



- Renewable seat—easily removed for servicing.
- Strong's patented, wear-resistant Anum-Melt† valve and seat—guaranteed leak-proof for one year. Scientifically designed Hi-Cap° orifice gives greater capacity.
- Oversized ports—increased capacity.
- Horizontal inline connections—simplifies piping.
- Stainless 18-8 high ratio leverage.
- Large gasket area.
- Seamless, deep drawn, stainless 18-8 bucket—no welds.
- Bottom drain or inlet connection.

Available for pressures from 0 to 150 p.s.i., the Strong* No. 070 fits all standard trap applications. Built especially for use on laundry, restaurant and hospital equipment and in industry wherever small drainage is a problem.

As with all Strong Semi-Steel Traps, the 070 is guaranteed against defects in material and workmanship for one year. Write today for Catalog 68-J.

*T. M. Reg. U. S. Pat. Off.

STRONG, CARLISLE & HAMMOND COMPANY

1392 WEST 3rd Street
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†Anum-Melt Reg. Trade Mark

OTHER STRONG STEAM SPECIALTIES

Reducing Valve

Blast Trap

Strainer

STRONG

"SPOT" NEWS OF INDUSTRY

(Continued from page 81)

Chemical Works is now operating a mine on the Maiden Rock phosphate deposit near Butte, Mont., and constructing a $5,000,000 plant for processing the rock into elemental phosphorous and eventually into phosphoric acid.

The Maiden Rock deposit is part of the Melrose phosphate field, about 25 miles southwest of Butte. The deposit has never attracted the fertilizer industry because the phosphate content of the rock is not high enough to make superphosphate production economical.

World's Highest Conveyer Belt Installed At New "Push Button" Mine in Illinois

The world's highest lift conveyer belt has just been installed by the Goodyear Tire & Rubber Co. in a new mine near Waltonville, Ill., a property of the Chicago, Wilmington & Franklin Coal Corp.

Constructed of rubber, fabric and steel, the 42-in. wide belt is capable of conveying 1,200 tons of coal per hour up a 3,290-ft slope to a height of 868 ft. The belt moves 625 ft a minute. A lump of coal deposited on the belt at the bottom of the mine is dumped over the head pulley five minutes and fifteen seconds later.

A 1,500-hp. synchronous motor driving the head pulley through an eddy current clutch, hauls the 90-ton belt with a 105-ton pay load up the 25% slope.

Ultimate plans for C. W. & F. Coal Corp's. new Orient Mine No. 3 provide for underground conveyer belts to carry mined coal to a 500-ton capacity surge hopper, which feeds the large slope belt. Conveyer belts handle the coal in all operations above ground.

To handle the enormous tensions created by the big lift, the belt had to be designed with steel cables as the strength carrying members. Design load of the belt is approximately 90,000 lb of tension.

Will Convert Former Radio Tube Plant to Manufacture Emergency Radio Equipment

General Electric will reopen a former radio tube plant at Utica, N. Y., and convert it to the manufacture of emergency radio communications equipment, according to a recent company announcement.

The equipment is projected for use in areas under heavy enemy attack, where normal telephone and radio facilities are destroyed or seriously disrupted. The plant is expected to be in full operation in June employing 425 people. Manufacture of the communications equipment will be moved gradually from the Electronics Park Plant at Syracuse.

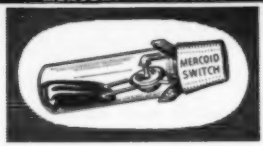
Sixth Giant Pump Completes Installation at San Joaquin Valley Irrigation Project

The sixth 22,500-hp Worthington centrifugal pump has been delivered to the U. S. Bureau of Reclamation project at Tracy, Calif., to complete that company's contract.

The pumps will give a 200-ft lift to water from the Sacramento River, sending it into the 120-mile Delta Mendota Canal to irrigate farms in the San Joaquin Valley.

Each pump is rated at 767 cu ft per second at a 200-ft pumping head. The completed plant will be able to pump three billion gallons every 24 hours. To house these pumps, the world's second largest pumping plant had to be constructed at Tracy in an excavation larger than Boulder Dam.

MERCOID
MERCURY SWITCHES



Superior Quality and Workmanship

They are not affected by dust, dirt or corrosion and have many definite applications where open contacts are not suitable. Various types available. MERCOID is your guarantee of the best in mercury switches. Further information sent upon request.

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SOLVES INDUSTRY'S AUTOMATIC CONTROL PROBLEMS

THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS

Designed to automatically regulate electrically operated equipment in accordance with changes in temperature, pressure, vacuum, or fluid level.

catalog upon request.

If you have a problem on the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff — always at your service.

THE MERCOID CORPORATION
4227 West Belmont Avenue, Chicago 41, Illinois
MANUFACTURERS OF AUTOMATIC CONTROLS FOR HEATING, AIR CONDITIONING, REFRIGERATION AND NUMEROUS INDUSTRIAL APPLICATIONS. ALSO MERCOID BRAND MERCURY SWITCHES.

Water Treating Equipment

for boiler feed—process sanitary requirements

Inversand Zeolite Softeners
Demineralizing Units
Silica Removal Equipment
Sludge Blanket Coagulators
Pressure and Gravity Filters
Condensate De-Oiling Filters
Degasifying Equipment
Hot Zeolite Softeners

All sizes and capacities. Manual, semi-automatic or fully automatic.

Write for free bulletins; or, at your request, a representative will call.

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Clayton, New Jersey
Over 50 years experience—Over 5,000 installations

Pick INSTANTANEOUS WATER HEATERS PROVIDE
HOT WATER INSTANTLY
. . . AT THE TEMPERATURE REQUIRED
. . . IN THE VOLUME NEEDED

ENGINEERED FOR ALL INDUSTRIAL NEEDS

★ PRODUCTION ★ PROCESSING ★ MAINTENANCE

A steam injection heater; PICK has the exclusive **Pressurizer Piston** that stabilizes injection pressure — eliminates pipe hammering and shaking. Fully automatic to provide and accurately maintain temperatures 40° to 180° F. Available in seven sizes with rated capacities of 10 to 200 gallons per minute. Any volume required can be obtained by using multiple installation. Compact design — saves space and installation cost.

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ANNEALING
ELECTROLYTIC PLATING

★ ***TEXTILES***
BLEACHING
DYEING

★ ***FOOD PROCESSING, DAIRIES, PACKING PLANTS***
WASHUP (TO MEET INSPECTION REQUIREMENTS)

Write for Engineering Details and Specifications

MANUFACTURED BY
PICK MANUFACTURING CO.
WEST BEND, WISCONSIN, U.S.A.

When your concrete floors develop cracks, ruts, shallow holes or rough spots, repair them with Smooth-On No. 7B Quick Floor Patch Cement. It comes in powder form ready to mix with water. Simply apply Smooth-On No. 7B as you would plaster. Smooth-On No. 7B expands slightly as it hardens, insuring a secure, tight fit. You get an iron-hard surface that can take the punishment of heavy traffic. Order Smooth-On No. 7B Quick Floor Patch Cement in 1, 5, 20, or 100 lb. size.

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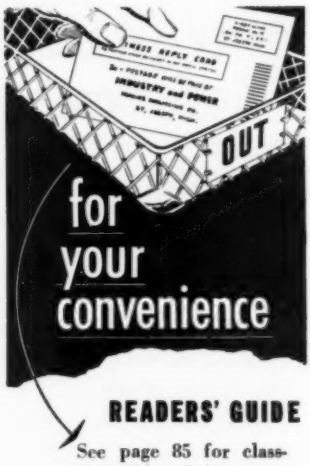

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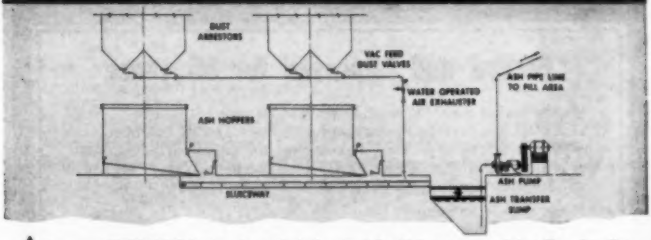

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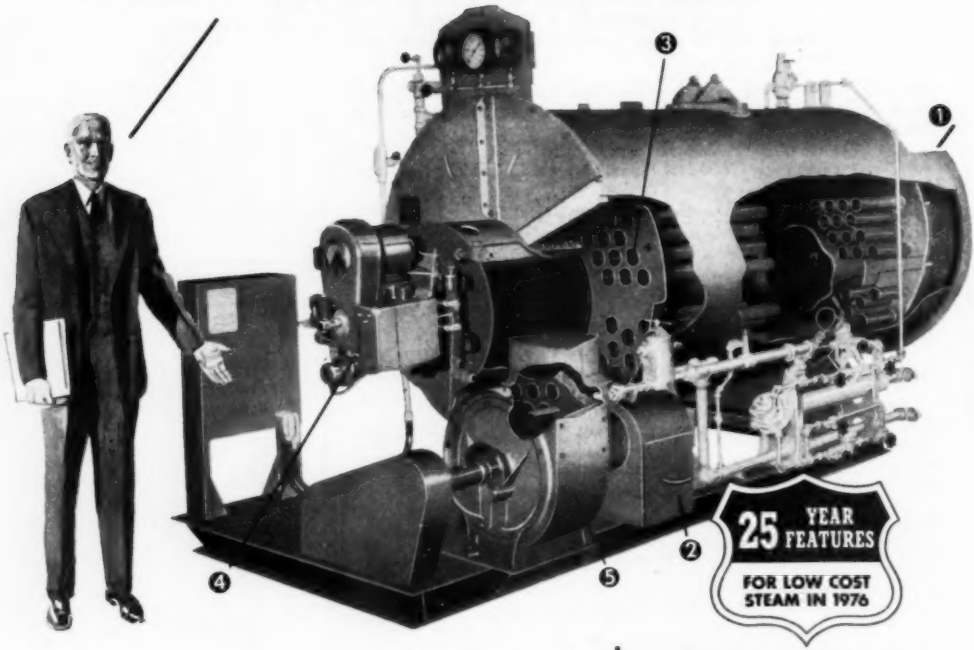

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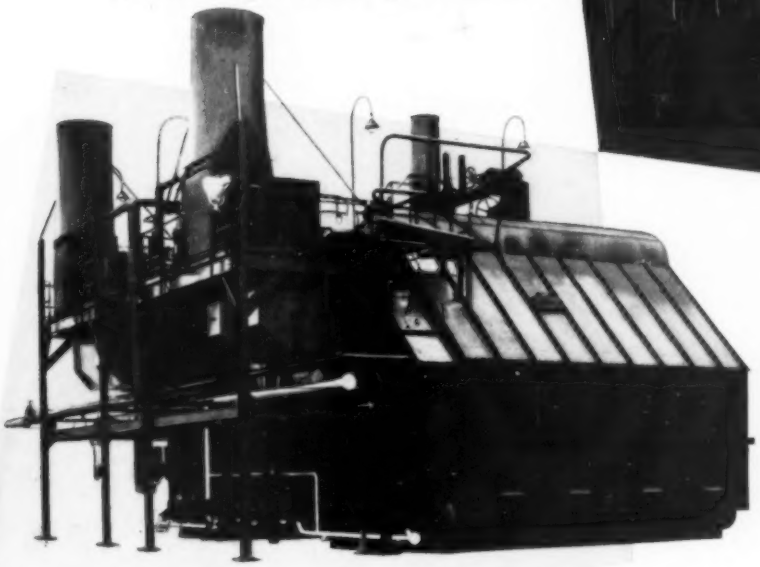

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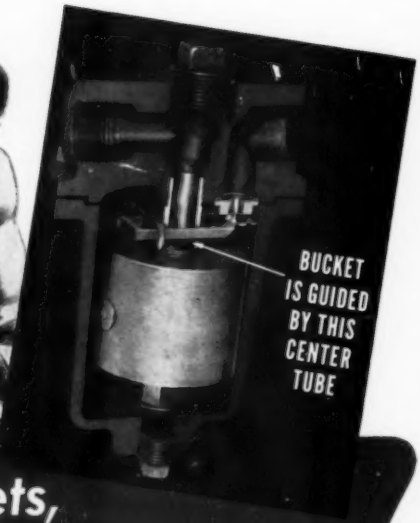

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